

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY (Leave blank)			2. REPORT DATE 21 May 98	3. REPORT TYPE AND DATES COVERED
4. TITLE AND SUBTITLE FACTORS THAT IMPACT NURSES' UTILIZATION OF ELECTRONIC MAIL (E-MAIL)			5. FUNDING NUMBERS	
6. AUTHOR(S) Judith Ann Hughes				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) The University of Texas Graduate School of Biomedical Sciences			8. PERFORMING ORGANIZATION REPORT NUMBER 98-020	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) THE DEPARTMENT OF THE AIR FORCE AFIT/CIA, BLDG 125 2950 P STREET WPAFB OH 45433			10. SPONSORING/MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES				
12a. DISTRIBUTION AVAILABILITY STATEMENT Unlimited distribution In Accordance With AFI 35-205/AFIT Sup 1			12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words)				
<div style="border: 1px solid black; padding: 5px; text-align: center;"> DISTRIBUTION STATEMENT A Approved for public release; Distribution Unlimited </div>				
14. SUBJECT TERMS			15. NUMBER OF PAGES 98	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT	

19980527 031

DTIC QUALITY INSPECTED 2

FACTORS THAT IMPACT NURSES' UTILIZATION OF ELECTRONIC MAIL (E-MAIL)

A
THESIS

Presented to the Faculty of
The University of Texas Graduate School of Biomedical Sciences
at San Antonio
in Partial Fulfillment
of the Requirements
for the Degree of
MASTER OF SCIENCE IN NURSING

By
Judith Anne Hughes, BSN

San Antonio, Texas

May 1998

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FACTORS THAT IMPACT NURSES' UTILIZATION OF ELECTRONIC MAIL (E-MAIL)

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DEDICATION

This thesis is dedicated
to my husband, Brian.

Without your encouragement and unselfish sacrifice, I never would have completed a project of such magnitude. I initially felt guilty about all the time you had to spend with the kids, but I have watched a beautiful and special relationship develop between you and our children, Connor and Audrey. I do not think they will remember losing their mom to a thesis, instead, I believe they will remember the quality time spent with their dad that is so rare in today's families. I guess it's God's way of showing us there is a silver lining behind every gray cloud and we must always try to remember that life, our life, is good.

ACKNOWLEDGMENTS

I am indebted to many people for the successful completion of this thesis.

Genuine, heartfelt gratitude is extended to Dr. Ruth Pakieser, the chairperson of my thesis committee. Her enthusiastic willingness to take on this project, coupled with her commitment to always be available to critique yet another version of a chapter or just to listen to my frustrations, facilitated my success.

My sincere thanks is also expressed to the additional members of my thesis committee for their guidance and counseling during this process: Dr. Elaine Graveley, Dr. Gail Williams, and LtCol Joseph Schmelz. I have benefited greatly from having the feedback and perspective of all the committee members.

A special acknowledgment must be extended to Dr. Linda M. Hunt. Without her willingness and ability to share her knowledge and love of qualitative research in “concrete” terms, I never could have completed data analysis on time. Thanks for walking me through the extensive coding process one step at a time. Your assistance was priceless.

I must also thank my family and friends for their prayers and encouragement. Somehow they always knew I could do this and the realization that others believe in you is a powerful motivator.

I would like to recognize my fellow classmates who have endured this grueling process along with me. A special thanks to Captain Nina Watson and Captain Meg Walsh for venting with me, encouraging me, and appreciating my efforts through five semesters together.

I am indebted to the United States Air Force Nurse Corps for providing the opportunity to attend graduate school on a full time basis. Gratitude is also expressed for the honor of receiving a monetary research grant from Sigma Theta Tau, Delta Alpha Chapter.

FACTORS IMPACTING NURSES' UTILIZATION OF ELECTRONIC MAIL (E-MAIL)

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The purpose of this study was to identify factors that impact nurses' utilization of electronic mail (e-mail) in the workplace. Specific barriers and facilitators to nurses' use of e-mail were identified and described. Not all nurses with e-mail accounts are using e-mail. However, there has been no previous research dedicated to identifying the factors that affect nurses' use of e-mail. Increasing nurses' utilization of e-mail is necessary to increase nurses' professional productivity and will affect nursing practice, research, education and administration. This qualitative study employed a descriptive research design. Data were gathered through three separate focus group interviews with a total of 17 nurses representing three different nurse

populations. Content analysis was used to identify and label seven major categories of factors that impact nurses' utilization of e-mail: perceived disadvantages/benefits of use, individual personal traits, technical capabilities of the system, security issues, individual instruction, access and support. Specific factors identified were generally consistent with the types of barriers and facilitators described in the literature to affect use of computers in general. However, there were several additional factors identified that were unique to nurses and to e-mail: lack of face to face communication, individual writing skills, timing of educational experience, volume of mail received, password integrity, and technical support. Findings from this study provide valuable information for any individual involved in introducing or updating an e-mail system in a healthcare environment. Components of an ideal e-mail system were highlighted. Future research needs to be directed toward identifying and verifying the relationship that exists between each of the factors found to impact use and the decision making process individual nurses use when attempting to adopt this technological innovation.

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I. INTRODUCTION

A. Overview of Problem Area

The Electronic Age is upon us and organizations' use of electronic mail (e-mail) is growing rapidly (Gardner, 1993; Updegrove, 1991). Despite the fact that e-mail has become a term in everyday vocabulary, nurses are just beginning to use the wide range of electronic communication services available to them (Holtzclaw, Boggs, & Wilson, 1993). The research literature contains few reported surveys of nurses' use of e-mail but there are several anecdotal references to nurses' failure to use e-mail (Hebda, Czar, & Mascara, 1998; Holtzclaw et al., 1993; Murray, 1996; Staggers, 1996). Staggers (1989) identified nurses as primary processors of information. It has been estimated that 35% of a nurse's time is consumed in information related activities (Romano, 1990). As e-mail is used more frequently by increasing numbers of groups and individuals to share and disseminate information, nurses must begin to interact with this electronic form of communication.

B. Significance to Nursing

Reinhardt (1993) predicts e-mail will soon become as pervasive as the telephone. E-mail can enhance the productivity and accountability of both individuals and organizations (Staggers, 1996). E-mail can be used for routine communications in large institutions and hospitals or in any organization where face-to-face communication is difficult. E-mail can eliminate "telephone tag" and eliminate or shorten many routine meetings (Hebda et al., 1998; Staggers, 1996; Updegrove, 1991). Administrative uses include sending meeting minutes, agendas, policies, announcements or general inquiries to individuals. E-mail can also have direct

health care applications as it may be used for routine consultation, laboratory results retrieval, and on-line educational programs offering continuing education units (Hebda et al., 1998; Staggers, 1996). Utilization of this communication system can save time by increasing flexibility and organization in nurses' schedules and save money. These benefits are not only valuable to administrators, but to busy staff nurses who may require less time away from the bedside to attend an inservice, committee meeting or to answer the telephone.

A study reported by Magnus, Co, and Derdach (1994) examined the impact nursing informatics can have on current and future nursing practice. An extensive review of newspaper and journal articles that addressed new and emerging aspects of the computer world revealed that the most popular emerging trend in nursing informatics was "the importance of information technology in increasing the efficiency and effectiveness of everyday nursing practice" (p. 190). Therefore, it is important to identify which factors influence nurses' use of computer communication systems so interventions to increase nurses' utilization of e-mail can be aimed in the appropriate directions. Only when specific barriers are identified can effective strategies be developed to reduce or eliminate them.

In summary, increasing nurses' utilization of e-mail is necessary if nurses want to continue to increase their professional productivity (Magnus et al., 1994; Staggers, 1996; Updegrafe, 1991). As Staggers (1993) points out, optimizing information processing will affect nursing practice, research, education and administration.

C. Purpose of the Study

The purpose of this study was to identify factors that impact nurses' utilization of e-mail in the workplace.

D. Research Question

The proposed study focused on the following research question : What do nurses identify as barriers and facilitators to the use of e-mail in the workplace?

E. Definition of Terms

1. Nurse Any individual licensed to practice as a registered professional nurse in the United States. For this study, the term includes those nurses working or studying full time in an institution that provides them individual electronic mail accounts.

2. Barrier Factor or circumstance identified as hindering a nurse's ability or desire to utilize e-mail for any purpose.

3. Facilitator Factor or circumstance identified as encouraging or promoting a nurse's ability or desire to utilize e-mail for any purpose.

4. Electronic mail (e-mail) A computer based system for exchange of messages and other information between individuals or groups in institutions connected via a network.

5. Workplace The environment in which nurses perform the majority of their job related activities.

II. REVIEW OF THE LITERATURE

The initial review of the literature found few studies pertaining to nurses' utilization of e-mail. To gain insight into related issues the review was expanded to include nursing literature concerning diffusion of technological innovations and factors affecting nurses' use of computers in general. In addition, the review attempted to explore nursing research for studies that identified specific factors affecting e-mail use. No nursing research met this specific criterion so non-nursing research was then reviewed for studies that identified factors that impact use of e-mail. Finally, Rogers' (1983) diffusion of innovations theory was adopted as a theoretical framework and used to organize the findings of the literature review.

A. Nursing Literature

1. Nurses' use of e-mail

Only three studies reported statistics on nurses' use of e-mail (Fullerton & Graveley, 1998; Ngin & Simms, 1996; Sands, Safran, Slack, & Bleich, 1993). Sands et al. (1993) studied e-mail usage patterns in a large teaching hospital over a one week period. This report was the first detailed assessment published about e-mail use in healthcare institutions. The study had two parts: an observational study of all e-mail usage in a one week period and an electronically administered questionnaire. The study involved 3,660 authorized e-mail users. During the one-week study, 1,247 persons sent 7,482 messages to 1,302 different recipients. The study reported the proportion of users in each user category (nurses, attending, house officer, other) who used e-mail during this study period; 28% (n = 373) of the total eligible nurses in the hospital (N = 1,341) used e-mail. These nurses sent 17% (n = 1,255) of the mail messages during the study period. The hospital's information system had the capability to audit and report usage; these

were not self reported usage statistics. The authors noted that the proportion of each user category who used e-mail appeared low; they attempted to explain this by pointing out that the clinicians rotate to other hospitals. This rationale does not explain nurses' lack of system use since they are not subject to rotation. The study sample limited the generalizability of the results since it only examined subjects' use in one institution and unlike most hospitals, this particular institution had e-mail in place for over 20 years.

The second part of the study involved electronically administering a 24 item questionnaire to the 3,660 subjects through the e-mail system (Sands et al., 1993). The response rate to the questionnaire was 50% ($n = 1816$). The questionnaire solicited information related to self-reported usage patterns and attitudes toward e-mail in addition to perceived utility of e-mail in various situations, and specific use in patient care situations. Sixty-six percent ($n = 1,198$) of respondents said they used e-mail daily or weekly and this had a high correlation ($r = 0.6$) with previously measured use. The authors reported the following independent predictors of using e-mail to contact an individual rather than paging or telephoning: (a) heavy use of e-mail, (b) extensive use of the information system to look-up clinical information, (c) perceived utility of this medium, and (d) not being a nurse. Fifty-eight percent of respondents ($n = 1,053$) said they used e-mail to send information regarding patient care and 95% ($n = 1,725$) reported e-mail was useful for administrative functions. Ninety percent ($n = 1,634$) reported e-mail made their lives easier and 61% ($n = 1,107$) said e-mail "had a humanizing influence on their communication" (p. 309). Separate statistics were not reported for different user groups. These statistics must be interpreted in light of possible sample bias since only those using the e-mail system would have seen the survey and had the opportunity to respond. The questionnaire failed to include e-mail non-users' attitudes.

A second study that reported statistics of nurses' e-mail utilization was conducted by Ngin and Simms (1996). They examined the computer use of over 500 nurses working in three urban teaching hospitals and reported statistics on the types and frequency of computer information systems used by these clinical nurses and nurse managers. This study identified that staff nurses more frequently use computers for communication and report greater uses of e-mail than the nurse managers. Nurses were asked to rate how frequently they used each system on a scale of one to five, where 1 = never, 2 = rarely, 3 = sometimes, 4 = often, and 5 = everyday. The mean score for e-mail use by clinical nurses was 3.54 and the mean score for nurse managers was 2.76. The authors did not report standard deviations so it is difficult to assess the number of nurses actually using e-mail. Actual frequencies of responses were not reported; therefore, conclusions cannot be drawn about how many nurses in the study did not use e-mail at all.

The final study to report statistics of nurses' use of e-mail was an intervention study that addressed computer literacy and involved the development and evaluation of a self paced computer tutorial for nursing graduate students (Fullerton & Graveley, 1998). A pre-intervention questionnaire was completed by 76 graduate nursing students at one university. All participants had been automatically registered for a university e-mail account at their initial registration and received a letter within two weeks from the Computing Resources Department indicating their user name and initial password. In spite of this global access to e-mail accounts, only 44 (61%) of the sampled nursing students said they used a computer for e-mail.

Despite a lack of systematic surveys of nurses' use of e-mail, anecdotal opinions regarding nurses' failure to utilize e-mail were prevalent in the literature. Hebda et al. (1998), in a recently published informatics handbook targeted to nurses and health care professionals, noted that although e-mail had gained popularity in other settings, use of e-mail was not yet widespread

within healthcare institutions. In a chapter section devoted to e-mail, the following advantages were described: eliminates telephone tag, convenient, easy to prepare and send, saves time and money, delivery can be almost instantaneous, and messages are time-and date-stamped (p. 49). Several disadvantages of e-mail were also characterized: interpretation of messages without the benefit of voice inflection, high volume of messages sent and received, viral contamination with e-mail attachments, and security concerns related to maintaining confidentiality (p. 49). The authors also specified several informal rules for e-mail use. Interesting to note was the rule promoting frequent changes in passwords for e-mail access. This was the first mention of security concerns and password integrity in the reviewed literature related to e-mail.

Staggers (1996) identified various modes of communication that have been adopted by nurse executives for effective information management. She identified e-mail as one such type of communication but points out that although promising, the interactive technology of e-mail is being adopted slowly. Staggers (1989) pointed out the most obvious problem with using e-mail is the need for computer equipment and software.

Holtzclaw, Underman and Wilson (1993) also confirmed that e-mail, despite being an emerging mode of communication, was underused by nurses. In an article designed to provide information on the electronic network, BITNET (Because It's Time Network), they reported that few nurses' used electronic communication to its full advantage despite the growing use of computers by nurses for word processing, data management and spread sheets. Murray (1996) reported that although nurses have increased their use of worldwide computer mediated communication, the number of nurses actually doing so is small.

In summary, if the health care literature is any indication of e-mail utilization, it is still at a beginning stage of adoption. Only a few articles addressed e-mail applications in health care.

Staggers (1996) reported the use of e-mail in health care is not yet widespread; she pointed out an on-line search of business literature revealed 4,000 citations for e-mail whereas the same search in health care located only a few articles. The same searches done in May, 1997 by this investigator, revealed an increase of citations in the nursing literature to 200, still significantly lower than the extensive number cited in business literature.

2. Diffusion of technological innovation

Nursing research on computer use has focused almost exclusively on nurses' attitudes towards computers. A few studies have been done that examined adoption or diffusion of technological innovation (Chang, 1984; Lewis & Watson, 1997; Romano, 1986; Romano, 1990). Romano (1986) detailed the development, implementation and utilization of a computerized information system for nursing that included an electronic messaging system but provided no statistics on nurses' use of the system. Chang (1984) studied the willingness of nurses to adopt computer technology after attending a computer workshop but did not measure actual use either before or after attendance. Chang's research did note that those nurses with favorable responses and expectations of computers were more willing to interact with computers. In an article written on the topic of diffusion of technology innovation, Romano (1990) pointed out that just the existence of technology does not ensure it will be adopted or incorporated into an environment. She identified the five most frequently studied attributes perceived by potential users that affect the rate of adoption of an innovation: (a) relative advantage, (b) compatibility with existing values and experiences, (c) complexity, (d) ability to be tested, and (e) visibility of results. She also pointed out that although general research on diffusion of technology innovations was extensive, there were very few studies that have focused on nursing.

In an intervention study designed to identify nursing faculty concerns about the use of computer technology, Lewis and Watson (1997) administered a Stages of Concern (SOC) questionnaire and a technology use survey to nursing faculty before and after their participation in a series of computer technology and literacy workshops. From their review of the literature, the authors reported that willingness to adopt technology is closely tied to faculty members' attitudes. They also noted that some educators view the computer as interfering with providing adequate personal attention to students. Lack of time for faculty to learn about technology and lack of up-to-date hardware and quality software were also reported to be previously identified constraints affecting faculty's adoption of a technology innovation.

Fifty-seven faculty members responded to the initial SOC questionnaire and technology use survey distributed to all graduate and undergraduate nursing faculty at a university school of nursing (Lewis & Watson, 1997). Twenty-eight of these nursing faculty members (49%) participated in the computer technology workshops and completed post-workshop technology surveys. The results of the SOC questionnaire established several distinctive trends. However, these trends were not statistically significant, a fact the authors attributed to the small sample size.

The technology use survey attempted to determine the participant's current level of use of common technology-based devices and common software applications. E-mail use was not specifically queried. The authors reported that the SOC findings supported the results of the survey that identified this group of nurse educators had little experience with computers. Additional questions related to faculty members' perceived barriers to computer use were included on the post-workshop survey. Only 36% ($n = 10$) of the participants who filled out post-workshop surveys responded to these questions. The most frequently cited barriers were

related to availability of computers and time to learn. The following specific barriers were identified by these nursing faculty members ($N = 10$): (a) lack of time to learn ($n = 7$); (b) lack of hardware ($n = 7$); (c) too many responsibilities ($n = 3$); (d) lack of software ($n = 2$); (e) availability of classes ($n = 2$).

3. Nurses' use of computers

Although there has been no formal nursing research done for the specific purpose of examining the factors affecting nurses' utilization of e-mail, several studies examined nurses' use of computers in general. A common theme throughout several studies was that nurses' use of computers was much less than anticipated (Jacobson, Holder, & Dearner, 1989; Mills & Staggers, 1994; Perry & Mornhinweg, 1992). Perry and Mornhinweg (1992) surveyed 152 staff members working in a military hospital in an attempt to profile the participant's level of computer literacy. Over half of those surveyed ($n = 78$) had either never used a computer or had been using one less than one year. The authors also reported that 75% of the sample had indicated either no exposure to computers during their formal education or exposure of less than once a week. Despite the rapid growth of technology, the percentage of nurses reported by Perry and Mornhinweg to have no computer experience was similar to the percentage reported three years earlier by Jacobson et al. (1989). This study surveyed 600 nurses about their use of computers. This sample ($N = 600$) included nursing students, educators, managers and staff nurses. The authors reported that 20% of the nurses surveyed reported no experience with computers.

A more recent study reporting statistics on nurses' use of computers confirmed the same circumstance. Mills and Staggers (1994) surveyed 145 female clinical nurses in an attempt to identify computer screen design and nurse characteristics that would facilitate the use of

computers by clinical nurses. Participant's computer experience was assessed using the Staggers Nursing Computer Experience Questionnaire. A total of 110 nurses completed the survey for a return rate of 75.9%. The authors reported that overall previous computer experience was very low in this sample. The mean score for previous computer experience was 29.27 ($SD = 15.17$) out of a possible score of 292. The majority of participants (77%) rated themselves as novice computer users on a novice-to-expert scale.

4. Factors affecting nurses' use of computers

Related nursing studies involving computers identified several specific factors that may have influenced a nurse's decision to use a computer (Dillon, McDowell, Norcio, & DeHaemer, 1994; Ngin & Simms, 1996; Staggers, 1994; Staggers & Parks, 1993). Ngin and Simms (1996) examined the computer use of 528 nurses in three urban teaching hospitals. The authors reported human and environmental barriers to learning new computer skills. Factors reported to have a negative effect on nurses' computer usage included : (a) only one computer on a unit, (b) the computer locked in the nurse manager's office, (c) no printer access and (d) no work time allotted to attend much needed inservice computer classes. Factors that demonstrated positive correlations with computer usage included: (a) high computer skill levels and (b) prior experience with computer information systems. Social norms and values, including degree of management support and encouragement from colleagues, were also reported to affect use of computer technology.

Staggers (1994) developed an instrument that measured nurses' perceived computer knowledge and experience. This questionnaire included a section for participants to identify why they may not have used computers in the past by selecting items from a list of potential reasons. Some of the choices selected by nurses included: lack of computers at work, personal anxiety

caused by computers, lack of formal computer training, and no requirement for computers in job. Additional reasons added to the instrument after pilot testing included: not enough time to use computer, computer use not in job description, and fear of losing files or information. Staggers failed to report the number of nurses who indicated each variable as an obstacle to computer use.

Another factor identified in the literature that can influence nursing staff to adopt or reject a computer system were the qualities and characteristics of the user interface (Dillon et al., 1994; Staggers & Mills, 1994; Staggers & Parks, 1993). Dillon et al. (1994) describe quality of the interface in terms of convenience and ease of system use. Staggers and Mills (1994) pointed out that individual cognitive and demographic characteristics are also a part of the interface and could include the following: age, previous computer experience, perceptual speed, spatial visualizations skills and spatial memory. Computer characteristics were also shown to affect interface actions (Staggers & Parks, 1993). These include processing speed, keyboard height, screen tilt, furniture design, and mouse vs. keyboard cursor keys.

B. Non-Nursing Literature

There were no nursing studies that identified specific factors impacting use of e-mail. Non-nursing literature however, had examined this topic. A review of non-nursing studies involving computer mediated communication systems (CMCS), which includes electronic mail, was completed by Rice (1987). Although dated, this report is the basis for much of the current literature related to e-mail and no recent articles are as comprehensive and detailed as Rice's report. The purpose of Rice's research project was to identify the processes by which CMCS were adopted. It was an extensive review including over 200 references. Rice reported that his review of the literature demonstrated the process of adoption of a CMCS is influenced by several factors: individual cognitive styles, capabilities and preferences, and access to a system. User

access to a system was not limited to physical access but included reliability of the system and ease of learning the control language. Rice cited multiple studies that show increased access led to increased use.

Rice (1987) also reported that a potential user's interpersonal network would influence CMCS adoption. An individual's peers provide social information about using a system and affect the acceptance of the system. Peers or coworkers also role modeled adoptive behavior. In addition, Rice reviewed studies that demonstrated a relationship between the use of electronic messaging and the perceived appropriateness of the media for the type of communication activity. As communication was perceived to require more social presence, the use of electronic messaging was decreased.

There were also demographic variables that may have exhibited a relationship with adoption of electronic messaging. Rice's review identified the following relationships: (a) age is negatively associated with acceptance and use of technological innovations, in particular, CMCS adoption; (b) members of an organization with low tenure are more likely than long-term members to use CMCS for social purposes as a means of learning about the organization's culture; (c) a potential user's position level or job description influences adoption of CMCS.

Rice (1987) reviewed research that supports Rogers' theory that communication channels are involved in innovation adoption. He reported that users prefer to learn a new system from their peers. Vendor manuals and introductory seminars were noted to be useful for learning the basics of a system but did little to influence behavior.

A study by Golden, Beauclair, & Sussman (1992) surveyed 200 electronic mail account holders at an urban midwestern university in an attempt to identify the perceptions of organizational factors that influence behaviors of EMS (electronic mail systems) users. The

authors included a complete delineation of their conceptual framework and an extensive review of the literature. The subjects who reported formal and informal pressure to adopt the system had higher usage rates. The mean usage of the group reporting formal pressure was significantly higher (32%) than the mean of those subjects reporting no formal pressure (13%). The subjects experiencing informal pressure reported usage rates of 25 % while those experiencing no informal pressure reported a usage rate of 11 %. The standard deviation was not reported. The authors also reported a relationship between the use of e-mail systems and perceptions of the medium's effectiveness. Limitations to the generalizability of this study's results include the sample incorporating subjects from only one institution and the reliability of self reported data.

In a comprehensive article about e-mail, Updegrove (1991) mentioned several potential barriers to its utilization. Although not a formal research study, this report is valuable as the author referenced multiple educational trade publications and presented a view of current trends in e-mail use in education. This detailed synopsis offered guidelines to assist faculty, students and administrators to use e-mail networks effectively. In addition, it is the only article reviewed that identified barriers to the use of e-mail specifically. The following barriers were reported: lack of desktop access to a computer, lack of typing skills, failure of total work group to be connected and committed, overly complex systems, inappropriate e-mail use, and the perception that fax and voice mail were easier to use and offered many of the same advantages.

In summary, although the issue of lack of use of e-mail by nurses has been documented, there has been no research dedicated to identifying the factors that impact nurses' utilization of e-mail. Frequency statistics reported in several studies (Fullerton & Graveley, 1998; Ngin & Simms, 1996; Sands et al., 1993) reveal that not all nurses with accounts are using e-mail but no research has attempted to answer the question of why some do and some do not. This present

study identified barriers and facilitators to nurses' utilization of e-mail using a qualitative design in a descriptive research project.

C. Theoretical Framework

E.M. Rogers' (1983) diffusion of innovations theory describes the process by which new information or innovations are diffused and used. Rogers identifies four main elements in the diffusion process: (a) the innovation: the idea, practice, or object that the potential adopter perceives as new; (b) the communication channel: the means by which an individual communicates a new idea to one or several others; (c) time: the time it takes an individual to pass from first knowledge of an innovation through its adoption or rejection; and (d) the social system: a boundary within which an innovation is diffused. In simpler terms, Rogers defines diffusion as "the process by which (a) an innovation (b) is communicated through certain channels (c) over time (d) among members of a social system" (p. 11). Although not discussed as a separate element in the diffusion process, Rogers' model of the innovation-decision process includes characteristics of the decision-making unit as a factor influencing adoption.

An individual's decision to adopt or reject an innovation does not occur spontaneously. Rogers (1983) suggests that a potential adopter passes through five stages of a decision making process that include knowledge, persuasion, decision, implementation and confirmation. According to Rogers, knowledge occurs when the individual is aware of the existence of the innovation and gains some understanding of how it functions. Persuasion occurs when the individual forms a favorable or unfavorable attitude toward the innovation through interactions with colleagues or with someone the individual has perceived to be knowledgeable about the new idea. Decision occurs when the individual decides to engage in activities that experiment with the innovation. Participation in these activities leads to a choice of adoption or rejection.

Implementation occurs when an individual puts an innovation into use, often altering the innovation in some way. Lastly, confirmation occurs when the individual seeks reinforcement of the innovation decision made earlier.

This framework has its inherent assumptions. It assumes a person will pass through the five stages of the decision making process sequentially. It also assumes that barriers affecting any of the main elements of the diffusion process will result in lack of utilization of the innovation.

One issue addressed by diffusion research is the reason some innovations have a rapid rate of adoption and others are adopted more slowly (Rogers, 1983). According to Rogers, characteristics of the individual or potential adopter, the social system or organization, the communication channels and the innovation itself are all factors influencing the extent to which an innovation is adopted. Time is not singled out as Rogers points out that time does not exist independently of events, but is an aspect of every activity. Rogers reports that innovations perceived to possess greater relative advantage, compatibility, observability, trialability, and less complexity have a more rapid rate of adoption. Relative advantage was defined as the degree to which an innovation was perceived to be better than the idea it replaces. Compatibility referred to the degree an innovation was perceived to be consistent with a potential adopter's values, needs, and past experiences. Rogers described observability as the degree to which an innovation's results were visible to others. Trialability referred to the degree an innovation may be experimented with on a limited basis. Complexity was described as the perceived level of difficulty involved in understanding and using an innovation.

E-mail is considered a technological innovation. Therefore it is reasonable to expect that the factors affecting nurses' use of e-mail will parallel the elements outlined in Rogers' model of

the innovation-decision process and can be grouped into categories. The first category deals with characteristics of the potential adopter, the nurse using e-mail, and may include experience with computers, typing skills, perceived benefits of use, willingness to try new things, and the value of the communicated information to the individual (Holtzclaw et al., 1993; Ngin & Simms, 1996; Staggers, 1989; Staggers & Mills, 1994; Staggers & Parks, 1993; Updegrave, 1991). The second category deals with characteristics of the innovation, the electronic mail system, and may include computer processing speed, screen design, password requirements, volume of messages, privacy issues and printing capabilities (Dillon et al., 1994; Staggers, 1996; Staggers & Parks, 1993; Updegrave, 1991). The third category deals with characteristics of the organization in which e-mail is used and may involve computer access, time given to utilize system, benefit perceived by management or administration, support from key executives, other staff supportive of utilization, lack of informal pressure to utilize the system (Golden et al., 1992; Ngin & Simms, 1996; Rice & Hughes, 1987; Staggers & Parks, 1993; Updegrave, 1991). The last category deals with the characteristics of the communication channels, how the concept of e-mail was communicated to potential users and may include the implementation process, training programs, and evaluation (Holtzclaw et al., 1993; Rice & Hughes, 1987; Staggers & Parks, 1993). For the current study, this framework was utilized to develop and organize probing questions asked to study subjects who have firsthand knowledge of the variables impacting nurses' use of e-mail.

III. METHODOLOGY

A. Design

This was a descriptive study utilizing qualitative methodology. Qualitative research is particularly valuable for research about topics for which relevant variables have not yet been identified (Marshall & Rossman, 1989; Polit & Hungler, 1997). The purpose of this study was to identify factors that impact nurses' utilization of e-mail in the workplace, a topic not previously researched. Hence, there were no standardized tools already in existence that could be used to gather this data. Inductive methods are highly relevant and applicable to nursing practice (Powers & Knapp, 1995). Qualitative research uses inductive and in-depth methods to identify and describe the dimensions, variations, and importance of phenomena (Polit & Hungler, 1997). This qualitative study was designed to identify and describe specific barriers and facilitators that impact nurses' utilization of e-mail.

Data collection in qualitative research typically uses field techniques such as interviews and observation methods. This research project utilized interviews with groups, called focus groups. Focus groups are one example of an evaluation design that takes advantage of qualitative methods (Morse & Field, 1995). Stewart and Shamdasani (1990) point out that the most common purpose of a focus group interview is to conduct an in-depth exploration of a topic about which little is known. This design was selected because the research question under investigation could best be answered from the perspective of the participants.

B. Sample

Sampling selection in qualitative methodology is focused on obtaining subjects who can provide information describing the phenomenon of interest. This technique is known as

purposeful sampling (Morse, 1989). Morgan (1988) offers the following basic advice for selecting focus group participants: participants should have something to say about the topic and they should feel comfortable saying it to the others in the group. The more homogenous the groups are in terms of background and role-based perspectives, i.e. intergroup similarity, the fewer the number of focus groups needed. Homogeneity in social background or life styles, i.e. intragroup similarity, often encourages willingness to discuss topics in a group (Morgan, 1988). For this reason, several focus groups are usually utilized within a research project to increase the scope of beliefs and values that will be represented in the population under study (Morse & Field, 1995). Three different populations of nurses were identified for this study because each nurse group had different workplace environments, different primary job titles, and were anticipated to have different uses for e-mail related to their particular nursing role. This sample design aimed for homogeneity within the groups and heterogeneity between the groups.

For this project, focus group interviews were conducted with these three groups: (a) graduate nursing students at University of Texas Health Science Center San Antonio (UTHSCSA), (b) faculty at UTHSCSA School of Nursing and (c) registered nurses working at Wilford Hall Medical Center (WHMC). Use of three different populations represented an effort to avoid the limitation of single institution sampling, a limitation in previous studies involving e-mail (Golden et al., 1992; Sands et al., 1993). Potential subjects were nurses who had access to an e-mail account at their workplace. Candidates included those nurses who used their e-mail account or those who did not use it at all.

The recommended size for focus groups is between 6 and 10 subjects. It is also suggested researchers over-recruit subjects by at least 20 percent to cover for no-shows (Morgan, 1988). Hence, invitation letters describing the purpose of the focus groups were given in person

to a purposive sample of 10-15 nurses from each sample group (Appendix A, B, C), anticipating a final focus group size of at least eight nurses. The investigator identified possible WHMC participants by visiting the nursing units and asking personally for participation. Graduate nursing students and faculty were identified by personal contacts at the UTHSCSA. Focus group invitation letters were given in person by the investigator. Prior to receiving invitation letters, potential participants were asked if they used e-mail or not by this investigator or a member of the UTHSCSA faculty who assisted with faculty recruitment. The goal was to compose a focus group with a balance of e-mail users and non-users.

Subjects' rights were protected by the following procedures:

1. The potential participants received an invitation letter from this researcher (Appendix A, B, C) emphasizing that participation in the focus groups was voluntary. In addition to describing the purpose of the focus groups, the letter explained that all group discussions would be audiorecorded and that all information gathered would be reported anonymously. Participants were informed they could leave the group discussion at any time. Participants' voluntary attendance indicated their consent.
2. At the beginning of each focus group, the participants were once again verbally informed of their rights.
3. Audiotapes were transcribed but individual participants were not identified by name.
4. Data collected from different groups were assigned a code number for data transcription and analysis. Transcriptions were available to this researcher and her research consultants only.
5. This study received exempt status approval from the Institutional Review Board (IRB) at UTHSCSA and WHMC prior to all collection of data.

C. Data Collection

Focus groups can be used as a primary data collection method (Powers & Knapp, 1995). They generate data on a designated topic through group discussion and interaction. Each session was moderated by a group leader and conducted as an informal semi-structured interview. As suggested by Krueger (1998), an assistant moderator was also utilized. All the focus group interviews were conducted by this investigator utilizing the same assistant moderator. The discussions were audiorecorded and transcribed in their entirety. The transcripts were checked for accuracy by this investigator. The group format helped to correct interviewer and individual preconceptions of the factors impacting e-mail utilization. Through the discussion, focus group participants could confirm common perceptions and challenge each other's understanding of the barriers and facilitators involved in the use of e-mail. The present research study neutralized any barrier due to lack of software as it purposely included only those nurses whose workplace does have the technical capability for nurses to use e-mail already in place.

There is much debate over the level of moderator involvement in focus group research. Morgan (1988) describes it as a continuum with a low end and a high end of moderator involvement. Low levels are important for research goals that emphasize exploratory research and also important when doing a full scale content analysis so results analyzed are those of the participants and not the moderators. High levels of involvement are appropriate when comparing the thinking of a new set of participants with what has been found in previous groups. It also provides the ability to ensure that a desired set of topics will be covered. As this research project had goals related to both levels, the moderator attempted to balance between the two extremes. This investigator took a stance of active and open listening, soliciting specific details and introducing topics not mentioned, but not at the expense of preventing participants from raising

their own points of view. The assistant moderator took comprehensive notes, operated the tape recording equipment, and occasionally probed the response of a participant in more depth. Most importantly, the assistant moderator provided an oral summary at the end of each focus group discussion and invited participants to offer any additions or corrections to the summary.

A moderator guide was utilized with open ended questions (Appendix D). Morgan (1988) suggests it is useful to organize the discussion topics into a guide the moderator may follow in more or less the same order from group to group. This technique facilitates making comparisons across groups during the analysis phase. To stay within the usual focus group time span, Morgan also suggests limiting the number of questions and including pre-planned probes under each topic. In addition, minor revisions in the moderator guide were made after the first focus group in order to explore particularly relevant themes and facilitate discussion among group members. Each focus group lasted approximately 90 minutes.

Demographic data were also collected in the form of a short questionnaire distributed to each participant in the focus groups (Appendix E). The following demographic data was solicited for descriptive information on the sample: age; gender; highest level of education; date of last educational degree received; length of time as a nurse; identification of primary job function as clinical, administrative, student, teaching or research; and whether they have a computer at home. Participants were also asked to identify how often they use e-mail at work given the following options: (a) use e-mail independently every time I am at work at least 80 % of the times, (b) never use my e-mail account, (c) utilize my e-mail account only if someone else does it for me, (d) use my e-mail account less than 25 % of the times I am at work, (e) other. Finally, participants were asked whether they were expected to use e-mail more than they do. No identifying data was requested from any participant on this demographic questionnaire.

The criterion for judging when to stop sampling different groups pertinent to a category is the category's theoretical saturation (Glaser & Strauss, 1967). Saturation implies that no additional data are being discovered whereby the investigator can develop further properties of the category. In order to reach saturation, a researcher should aim for differences between the groups that are studied in order to maximize the variety of data influencing a category (Glaser & Strauss, 1967). Theoretical saturation, according to Powers and Knapp (1995), is accompanied by personal saturation as the researcher concludes that the aim of data collection and simultaneous analysis has been carried as far as possible in each individual group session. According to Calder (1977), if the moderator can clearly anticipate what will be said next in a group, then the research is finished; this usually requires 3-4 groups. Personal saturation was determined by the moderator for each focus group discussion. Category saturation was obtained by the third group.

D. Data Analysis

There are several possibilities for analysis of qualitative data. Whatever method is chosen, the analysis process needs to be systematic and verifiable (Kingry, Tiedje, & Friedman, 1990). The analysis and interpretation of focus group data should be driven by the intent of the study (Carey, 1994; Kingry et al., 1990; Stewart & Shamdasani, 1990). This research project utilized content analysis as the method of qualitative data analysis. The goal in content analysis is to classify the many words of the text into much fewer content categories (Weber, 1985). The words or phrases identified in a single category are presumed to have similar meaning. Guidelines and rationales for categorizing qualitative research data develop as analysis proceeds (Powers & Knapp, 1995). This process has several steps (Kingry et al., 1990; Morse & Field, 1995; Polit & Hungler, 1995).

The first step in data analysis involved reviewing the assistant moderator's transcribed summary for each interview and establishing a label for each incident or issue mentioned. The assistant moderator's summary originated directly from the detailed notes taken during each focus group discussion. Many times the labels were the exact words the participants used to describe the factors that impacted their utilization of e-mail.

In the second step, related labels were formulated into categories and subcategories. The categories were named and numerically coded in an outline format. Initial analysis identified 12 major categories with 100 subcategories.

In the third step, all three transcripts were then analyzed for evidence of these categories and subcategories. When identified, the categories were distinguished by their numerical code in the margin of the transcript next to the identified unit of analysis in the text. Sentences and phrases were the unit of analysis for this study. Open coding (Strauss & Corbin, 1990) was utilized as each sentence and each incident was coded into as many categories as possible, allowing one unit of analysis to have several different codes.

The fourth step involved utilization of a color coded system to collate all the same category citations together. For each unit of analysis, the page and line number identifying where it appeared in the transcript were recorded onto a master coding outline under the appropriate category. Different colored ink referred to separate focus group transcripts. This enabled the investigator to link and easily retrieve similar categories found throughout the three transcripts.

Through the process of reanalysis and consultation with research consultants, several of the original 12 categories and their subheadings were combined for a total of seven categories with fewer subheadings. The last step was to compile the data into tabular form. The individual themes and some direct quotations coded for each collapsed category were recorded in a table

under the heading of barrier, facilitator or miscellaneous. According to Morgan (1988), the goal of a table is to summarize basic information related to the research enterprise and each cell in a table should represent a major topic of discussion.

Rosengren (1981) defined content analysis as the process of dividing text into units of meaning and quantifying those units according to certain rules. A common form of quantifying materials is the enumeration of recorded occurrences in each category (Morgan, 1988; Polit & Hungler, 1995; Weber, 1985). In analysis of focus groups' transcripts, a category or theme cannot be assumed to be absent when no relevant responses are mentioned in a session (Carey, 1994). Therefore, simple counts were not appropriate for this type of analysis.

E. Evaluation

Qualitative research cannot rely exclusively on criteria such as validity and reliability to explain or justify findings (Leininger, 1994). The basic question underlying the concept of reliability and validity is whether the data collected by the researcher reflects the truth (Polit & Hungler, 1995). Lincoln and Guba (1985) reference the term trustworthiness in the place of reliability and validity. They developed four criteria for establishing the trustworthiness of qualitative data: credibility, transferability, dependability and confirmability. Credibility refers to confidence in the truth of the data. They suggest peer debriefing and member checks to establish credibility. Peer debriefing and member checks were ongoing throughout data collection and analysis in this study. Peer debriefing involved the informal sharing of information and ideas with fellow research consultants playing the role, as suggested by Lincoln and Guba, of "the devil's advocate" (1985, p. 308). Member checks were carried out during focus group interviews as the assistant moderator verbally summarized each focus group discussion and asked for and received confirmation or clarification from the participants.

Transferability essentially refers to the generalizability of the data, that is, the extent to which data findings can be transferred to other settings or groups (Polit & Hungler, 1995). The results of the questionnaire filled out by focus group participants provide a basis for judging the applicability of these findings to similar nurse groups. According to Lincoln and Guba (1985) it is not the goal of qualitative research to provide an index of transferability; however, it should provide the database that makes transferability judgments possible.

Dependability relates to the stability of data over time and over conditions, and the ability to track the data in a manner similar to following an audit trail (Lincoln & Guba, 1985). Written records of focus group transcriptions and notes from the data reduction process, including category structures, were produced making it possible for an external auditor to examine the processes by which data were collected and analyzed.

Confirmability refers to the objectivity of the data (Lincoln & Guba, 1985). Polit & Hungler (1995) explain there should be agreement between two or more individuals about the data's relevance or meaning. To establish reliability of the categories and assigned codes, a colleague independently coded approximately one third of each group's transcript, to provide evidence of consistency. This colleague was to independently assign the identified category codes to the selected text segments. When comparing these two sets of codes, they were virtually identical, except for occasional minor discrepancies in the number of categories applied to one given unit of analysis. All omission discrepancies were resolved after discussion in favor of labeling the section with more than one code. This coding procedure met the criteria of confirmability.

IV. RESULTS

A. Sample

In this study, three separate focus group interviews were conducted with a total of 17 nurses participating. The first group consisted of graduate nursing students at UTHSCSA ($n = 7$). The second group was composed of nursing faculty from UTHSCSA ($n = 4$). The final group was made up of nurses employed at Wilford Hall Medical Center ($n = 6$). Data was collected over a three month time span. Each focus group lasted approximately 90 minutes and resulted in a total of 82 pages of transcribed data.

Age of the participants ranged from 31 to 65 years. Thirteen (76%) of the participants were female and 4 (24%) were male. Highest education level of participants ranged from baccalaureate degree to doctoral degree. Number of years since last nursing degree ranged from 2 to 42 years with a mean of 13.5 years. Length of time as a registered nurse ranged from 4 to 43 years with a mean of 19 years. Primary job functions of the participants included each of the following: clinical, administrative, teaching, research and student. Fourteen (82%) of the participants had a computer at home. Participant's self-described use of electronic mail ranged from never (6%; $n = 1$) to using e-mail every day participants went to work or school (82%; $n = 14$) with two individuals choosing usage patterns between those extremes. Five participants (30%) believed they were expected to use e-mail more than they actually did. Table 1 displays the specific demographics of each individual focus group and provides the actual frequency of responses and the percentage this frequency represents. Statistics are reported for each individual focus group and also for the entire sample combined.

Table 1
DESCRIPTION OF SAMPLE

	Group 1 Students <u>n</u> = 7	Group 2 Faculty <u>n</u> = 4	Group 3 Hospital <u>n</u> = 6	Entire Sample <u>N</u> = 17
AGE (Years)	Freq / %	Freq / %	Freq / %	Freq / %
31-35	1 / 14	0	4 / 66	5 / 29
36-40	2 / 29	0	1 / 17	3 / 18
41-45	3 / 43	0	0	3 / 18
46-50	1 / 14	1 / 25	0	2 / 12
51-55	0	2 / 50	0	2 / 12
56-60	0	0	0	0
61-65	0	1 / 25	1 / 17	2 / 12
Totals	7 / 100	4 / 100	6 / 100	17 / 101*
Gender	Freq / %	Freq / %	Freq / %	Freq / %
Female	4 / 57	4 / 100	4 / 67	12 / 70
Male	3 / 43	0	2 / 33	5 / 30
Totals	7 / 100	4 / 100	6 / 100	17 / 100
Highest Level of Education	Freq / %	Freq / %	Freq / %	Freq / %
Bachelor Degree	0	0	2 / 33	2 / 12
Bachelor Degree with some graduate work	6 / 86	0	2 / 33	8 / 47
Master's Degree	1 / 14	1 / 25	2 / 33	4 / 23
Master's Degree with some doctoral work	0	1 / 25	0	1 / 6
Doctoral Degree	0	2 / 50	0	2 / 12
Totals	7 / 100	4 / 100	6 / 99*	17 / 100

Note. Freq = Frequency. Frequency represents the actual number of times a particular answer was chosen as a response by the individual participants who filled out the questionnaire.

*Percentages do not total 100 due to rounding

Table continues

Table 1 (continued)

	Group 1 Students <u>n</u> = 7	Group 2 Faculty <u>n</u> = 4	Group 3 Hospital <u>n</u> = 6	Entire Sample <u>N</u> = 17
Number of Years Since Last Nursing Degree				
1-5	0	0	2 / 33	2 / 12
6-10	3 / 43	0	1 / 17	4 / 23
11-15	3 / 43	2 / 50	2 / 33	7 / 41
16-20	1 / 14	0	0	1 / 6
21-25	0	1 / 25	0	1 / 6
26 & over	0	1 / 25	1 / 17	2 / 12
Totals	7 / 100	4 / 100	6 / 100	17 / 100
Mean/ <u>SD</u>	11 / 3.37	18 / 8.18	13 / 14.78	13.5 / 9.67
Number of Years as a Registered Nurse				
1-5	0	0	1 / 17	1 / 6
6-10	2 / 28	0	0	2 / 12
11-15	3 / 44	0	4 / 66	7 / 41
16-20	2 / 28	0	0	2 / 12
21-25	0	0	0	0
26 & over	0	4 / 100	1 / 17	5 / 29
Totals	7 / 100	4 / 100	6 / 100	17 / 100
Mean/ <u>SD</u>	12.5 / 4.35	33 / 7.09	16 / 13.09	19 / 11.90
Primary Job Function*				
Clinical	0	0	4	
Administrative	1 / 14	0	3	
Student	6 / 86	0	0	
Teaching	0	4 / 100	1	
Research	0	0	1	

*One participant in group 3 selected several primary job functions, therefore the total frequency of responses and corresponding percentages are not reported for this variable.

Table continues

Table 1 (continued)

	Group 1 Students <u>n</u> = 7	Group 2 Faculty <u>n</u> = 4	Group 3 Hospital <u>n</u> = 6	Entire Sample <u>N</u> = 17
Computer at Home	Freq / %	Freq / %	Freq / %	Freq / %
YES	7 / 100	4 / 100	3 / 50	14 / 82
NO	0	0	3 / 50	3 / 18
Totals	7 / 100	4 / 100	6 / 100	17 / 100
E-mail Use	Freq / %	Freq / %	Freq / %	Freq / %
Never	0	0	1 / 17	1 / 6
Only if someone does it for me	0	0	0	0
Infrequently(Less than half the days I go to work or school)	1 / 14	0	1 / 17	2 / 12
Almost every day I go to work or school	6 / 86	4 / 100	4 / 66	14 / 82
Totals	7 / 100	4 / 100	6 / 100	17 / 100
Expected to Use E-mail More than You Do	Freq / %	Freq / %	Freq / %	Freq / %
YES	1 / 14	0	4 / 67	5 / 30
NO	6 / 86	4 / 100	2 / 33	12 / 70
Totals	7 / 100	4 / 100	6 / 100	17 / 100

Note. Freq = Frequency. Frequency represents the actual number of times a particular answer was chosen as a response by the individual participants who filled out the questionnaire.

B. Content Analysis Findings

Content analysis resulted in identification of seven major categories. Four of these categories included subheadings unique enough in content that they were not assimilated into a broader category. The major categories identified to impact e-mail use were named as follows: (a) perceived disadvantages/benefits of use, (b) individual personal traits, (c) technical capabilities of the system, (d) security issues, (e) individual instruction, (f) access, and (g) support.

These categories impacting nurses' utilization of e-mail parallel the components in Rogers' diffusion of innovation theory (1983). According to E.M. Rogers' theoretical framework originally described in the literature review, characteristics of the individual or potential adopter, the innovation, the communication channels, and the social system or organization are all factors influencing the extent to which an innovation is adopted. This research project specifically defined the components of Rogers' theory: the potential adopter was the nurse with an e-mail account; the innovation was the electronic mail system; the communication channel related to how the concept of e-mail was communicated to potential users; and the social system or organization was the organization in which e-mail is used. The seven categories of factors identified and their subheadings are displayed adjacent to their corresponding component of Rogers' theory in Table 2.

Table 2

COMPARABILITY OF ROGERS' (1983) DIFFUSION OF INNOVATIONS THEORY TO STUDY FINDINGS

Factors Identified by Rogers to Influence Adoption of an Innovation	Factors Identified in this Study to Impact Nurses' Utilization of E-mail
1. Characteristics of the potential adopter	1. Perceived disadvantages/benefits of use 2. Individual personal traits
2. Characteristics of the innovation	3. Technical capabilities of system -quality of interface -volume of messages -computer processing speed -hardware and software compatibility -printing -special features
3. Characteristics of the communication channels	4. Security issues -passwords -privacy
4. Characteristics of the organization	5. Individual instruction
	6. Access -physical access to computer -reliability of access into e-mail system
	7. Support -technical support -administrative support

The focus group members' comments about the factors impacting nurses' utilization of e-mail had negative and positive aspects. During content analysis, the negative factors were labeled barriers and the positive factors were labeled facilitators. It is important to mention that each of these categories had varying impact on the participants' use or nonuse of e-mail. The purpose of this investigation, however, was to identify and describe the barriers and facilitators to e-mail use elicited from the participants, not to compare the effects or measure the strengths of the categories. As previously defined, any factor or circumstance that hindered an individual's ability or desire to utilize e-mail for any purpose, was identified as a barrier. Facilitators were considered any factor or circumstance that promoted or encouraged an individual to use e-mail. Therefore, topics discussed by the participants did not have to demonstrate an all-or-nothing effect on e-mail use. The individual barriers and facilitators identified by the participants are organized by content analysis categories and listed in Table 3. Each of the categories identified through content analysis will be discussed in detail in the following sections.

Table 3

BARRIERS AND FACILITATORS TO NURSES' UTILIZATION OF E-MAIL

Category	Barriers	Facilitators
1. Perceived disadvantages/benefits of use	Lack of face to face communication Inappropriate medium for type of communication Not everyone uses e-mail	Lack of face to face communication Expedites global communication Facilitates group communication Provides documentation and accountability Eliminates phone tag Deletes requirement to be in office to communicate Replaces meetings for shift workers Saves time Cost efficient Environmentally friendly
2. Individual personal traits	Lack of knowledge Lack of time Staff nurse position Increasing age Lack of recent education Afraid to use e-mail Antitechnology Lack of typing skills Lack of writing skills	Prior computer skills No need for existing computer literacy Recent education Nursing management position Nursing education position Perceived expectation to use e-mail Belief that it is essential for nurses in the future
3. Technical capabilities of system -quality of interface -volume of messages -computer processing speed -hardware and software compatibility -printing -special features	Text based e-mail systems Numerous messages that do not relate directly to individual Messages written in other applications Bulletin board messages improperly categorized Slow computer processing speed Inability to read or send attachments No printer Poor quality printer Shared printer Inability to select individual messages to print	Graphical interface that utilizes icons Bulletin board with predetermined categories Ability to block unsolicited messages Faster computer processing speed Ability to send detailed data and documents Individual desk-top access to printer Laser printer Ability to select individual messages to print

Table Continues

Table 3 (continued)

Category	Barriers	Facilitators
4. Security issues -passwords -confidentiality	Requirement to frequently change password Requirement to choose password from preselected list Cumbersome process of obtaining password Exaggerated sense of privacy Lack of security awareness Fear of uninvited access to hard drive Shared printers and computer terminals	Individual network passwords Requirement to frequently change password Ability to customize individual passwords Presume system is not confidential
5. Individual instruction	Lack of formal e-mail course Failure to instruct account holders when system changes or upgrades Use system infrequently Lack of written instructions or on-line help	System-specific individual instruction Progressive courses Easy manual for reference On-line help instructions in e-mail application Knowledgeable coworkers and friends
6. Access -physical access to computer -reliable access into e-mail system	Not enough shared computers in work environment Concern for privacy when computer in central location Computer hardware inoperative Institutional computer systems malfunctioning High volume of users Organizational restrictions on personal use of e-mail	Individual desktop computers Working night shift Easy access from distant location Determining periods of low usage
7. Support -technical support -administrative support	Lack of technical support Inability of support personnel to understand problem Lack of off site support Needed equipment and software not financed by administration	Technical support available 24 hours a day Knowledgeable coworkers and friends who are easily accessible Commitment from administration to furnish individual equipment and upgrade software systems as needed

1. Perceived disadvantages/benefits of use

There were several disadvantages to the use of e-mail identified by the focus group participants. The problem referred to as lack of face to face communication inspired a lengthy discussion in all three groups and many participants considered it a barrier to the use of e-mail. Lack of face to face communication was believed by some, but not all, to impede effective conflict management by promoting passive-aggressive behavior. The dissenting opinion is presented in the following section describing the benefits of e-mail use. Most agreed not being able to read the receivers' nonverbal communication or body language could result in misunderstandings in communication. For example:

...you don't get the nonverbal piece to communications which helps us interpret what is being said. So that can be a real disadvantage...

...the clarity of the communication and intent can sometimes get jumbled.

Participants in all three groups also believed that electronic mail was sometimes an inappropriate medium for some types of communication. The following statements supported this concept as a barrier:

..my pet peeve is I think that people use e-mail for things that should be more personal.

I have been so angry at some of my bosses that sent something really important in e-mail.

...it (e-mail) doesn't replace leadership. Should not. While it's easy to be one on one, it shouldn't replace one on one.

Another disadvantage described in all three groups by all participants, was the problem that not everyone uses e-mail. E-mail was considered useless as a communication tool if the intended receiver does not use e-mail or just does not read his/her messages. This created a need for e-mail users to know who does and does not use e-mail to communicate. This often

prevented e-mail users from sending important messages to groups. The following statements supported this as a barrier:

I mean I never put anything in e-mail that I think my staff would want to know, that they need to know. Absolutely nothing.

...some of the people I need to contact ...don't read their e-mail, or they don't connect in, so it's worthless. It's like sending a message to a brick wall.

There were several benefits of using e-mail identified. Participants were consistent in identifying benefits of using e-mail. Only one participant who identified herself as a nonuser said she could not identify any benefits. During content analysis, features which participants identified as benefits were labeled facilitators. Interestingly, though lack of face to face communication was considered a barrier to use of e-mail by some participants, there were others with a different opinion. Several participants had experienced the lack of face to face communication as a facilitator for conflict resolution as it removed some of the inhibition present in face to face conversations. Other benefits of using e-mail included the following: expedites global communication, facilitates group communication, provides documentation and accountability, eliminates phone tag, avoids the requirement to be in office to communicate, replaces meetings for shift workers, saves time, is cost efficient, and is environmentally friendly.

2. Individual personal traits

This category included individual's demographic variables, education, opinions, motivations, learning styles, past experiences, nursing positions, and computer skills. Content analysis identified several barriers and facilitators within this category. Participants in all three groups identified lack of knowledge as a barrier. This included not knowing how to use the computer or the particular e-mail system. For example:

I think one of the biggest disadvantages is if you don't know how to use your system..

This issue is discussed in more detail under the category labeled individual instruction.

There was also group consensus that lack of time to use the system and lack of time to learn to use the system were barriers. For example:

It takes a while to build your confidence, and it takes a while to feel okay with making a mistake that it won't crash on you. I mean, you know, it's just one of those things you have to learn, and it takes a little bit of time.

Time to use the system was also associated with one's nursing position as it was felt that staff nurses do not have the time to use e-mail. Staff nurses were also noted to have more limited access to computers than those nurses in management or educational positions.

A few of the participants in the student group noted an inverse relationship between age and use of e-mail. In their experience, the older an individual, the less likely they were to use e-mail. Some also noted the same relationship with lack of recent education. Recent education, defined by those in the student group as going to school in the last four years, was recognized by some to promote use of e-mail. However, others in the student group and the faculty group had different experiences with coworkers who had recently completed advanced degrees but still refused to utilize e-mail as a communication tool. These participants believed individuals were intimidated or afraid of e-mail. The following statement from one of the participants declares that fear may indeed be a barrier:

I was really afraid that if I hit the wrong button the thing was going to blow up. It took me a while to realize I wasn't going to break the computer by making a mistake.

Several participants of different groups coined the term antitechnology when describing individuals who did not use e-mail. Lack of individual typing and writing skills were also identified as potential barriers to utilization of e-mail.

Participants in the student group and the hospital group identified prior computer experience as a facilitator to using e-mail. In contrast, members of the faculty group said that e-mail was such an easy computer application to learn, it did not require existing computer literacy.

For example:

E-mail was one of the first applications that I learned and felt comfortable with, so it's the one I suggest to other novice users as an entry level introduction to computers. So to people that are scared to death of computers, I say "Here, here's immediate success".

I'm always fairly amazed when people say, "Oh, I'm really afraid to deal with e-mail, I don't know anything about computers." Because e-mail to me seems like such a basic function.

..like your telephone as opposed to your computer...The computer is word processing.

The telephone is e-mail.

Some nurses said certain nursing positions were more readily associated with increased use of e-mail. Nursing positions in management or education were viewed as facilitators to use of e-mail. Members of the student group and the hospital group recognized that e-mail was convenient for many management related duties and that, traditionally, nurse managers have increased access to e-mail. Some also postulated it was a professional responsibility to read e-mail. The nursing faculty group observed that student computer literacy skills motivate faculty to learn how to communicate electronically.

All three groups noted that an individual's perceived expectation to use e-mail, whether from colleagues, coworkers or supervisors, facilitates use. For example:

I only use it at work because I have to.

The world is wired to e-mail and everything you see on television gives you an internet address anymore, so if not today then certainly tomorrow it would seem that 100% of the world is going to be working that way, and it surprises me when I find anyone that isn't.

I am amazed when I find someone at a university who doesn't use it (e-mail) at this level. Many hospital group participants related first hand knowledge of a nursing unit within their facility whose nurse manager used e-mail exclusively to communicate information and knowledge to her staff. They were aware that 100% of the staff nurses on that unit utilized e-mail. This effect is described below:

I know a nurse manager in the _____ made everything be e-mail, and she forced her staff to read the e-mail. And that's how they did it.

It works...I don't know how they have access to the computers, but they read it (e-mail).

Finally, all three groups recognized there are individuals motivated to use e-mail by the belief that it is an essential competence that will be required of nurses in the future. The following statements demonstrate this effect:

We recognize it is just essential competency...and essential competence of the 21st century nurse.

There's a big clamoring for not just e-mail skills, but computer skills among undergraduate nursing students to learn how to use automated systems and things like that..

And that's the other thing: that you have to be motivated.

Students need to have a computer course before they come in on how to use the e-mail and World Wide Web because that's going to be the way they're going to be communicating, especially with all the telemedicine and telehealth and telenurse. You know, they are going to be needing to have that expertise.

3. Technical capabilities of the system

This category fielded the largest amount of discussion among the student group, and was also brought up in the faculty group and the hospital group. In discussion related to this topic, the following areas were specifically identified: quality of interface, volume of messages, speed of system, hardware and software compatibility, printing, and special features of the system. Once again, there was a positive and a negative aspect to each of these subheadings. For organizational purposes, this segment will be cataloged by individual subheadings and the barriers and facilitators relating to each individual subheading will be discussed within those sections.

a. Quality of the interface. Quality of interface included not only what an individual viewed on the computer screen, but how convenient and easy a system was to use. Text- based systems, as opposed to icon-based systems were identified as a barrier to use by all three groups. Several facilitators were identified in the following comments:

I think those icons are a dream.

I want to see a screen that tells me this is what it offers and this is what it can do.

One of the biggest disadvantages is if your system... is not friendly.

Systems utilizing a graphical interface with icons were considered “user friendly” and were preferred and used more by members of all three groups who had access to several types of e-mail systems. Many participants had e-mail accounts at home in addition to accounts at work or school. All of the participants in the student group who had e-mail accounts at home preferred to use that e-mail account due to the fact that their school account was a text-based e-mail system.

b. Volume of messages. Another subheading that generated animated discussion in the student group and the hospital group was the volume of messages an individual received on their e-mail system. There was consensus among the group members that having to spend time reading numerous messages that did not relate directly to them was a barrier to use. For example:

..it was time consuming. It was a choice of do I want to eat lunch or do I want to look at my e-mail?

So I only check it out about once a month. It has about 120 messages in there from all kinds of dopes in the hospital like religious tolerance week and they are telling me all about the _____ on about four pages.

..everybody can send you everything, so it can be a waste of time sometimes. You're sitting down and working, and people are sending you 20 million e-mails...that can be a big disadvantage if half of it you don't care about.

Also identified as a time waster and a personal frustration were messages that were composed in a separate application and sent as an attachment, requiring the e-mail system to open up and exit from that application before being able to read the next message.

Related to this topic, there were several references to a bulletin board within the e-mail system. A bulletin board was described by a participant in the student group in the following terms:

A message posted on a bulletin board is posted where everyone has access to it. It is separate from messages sent to an individual's personal user name account.

Bulletin boards are created with separate category headings and messages can be posted under the appropriate heading. E-mail users can then choose when or if they want to read that message instead of receiving it in their personal e-mail account. Repetitive bulletin board messages and messages improperly categorized were described as barriers by study participants. However, in general, the use of bulletin boards was identified as one of the facilitators that enhanced use of e-mail. For example:

the system I really liked had a little icon where you clicked bulletin board or e-mail, and then knew it was your personal mail or bulletin board, and the bulletin board was categorized and there was some adherence to those categories...

There's so much stuff out there, and a lot of it is unimportant things that could just be in a miscellaneous or FYI category as opposed to the things that the commander or whoever wants you to know.

The other facilitator related to the subheading of messages was the ability to block unsolicited messages. The following comment summarizes the experience of most of the student group members:

If I could get rid of the needless ones I would love it. I need to get off that list. It's just I get a lot of junk mail. I'll go in and I'll have 30 messages, and I just checked it eight hours ago, and I have 30 messages and maybe one is a legitimate message for me.

c. Computer processing speed. A computer's processing speed was also described to have an effect on e-mail use. Faster computers promoted use. Many participants in the student group and the hospital group referred to feelings of frustration when attempting to use e-mail systems that operated on slower computers. The following comment received 100% verbal consensus when vocalized in the student group:

I mean we have become so impatient, is the right word. We used to be satisfied if it took a week for a letter turnaround, and now if it takes ten seconds before I can do something on my keyboard I just want to shut the thing down.

The following comment from the hospital group also supports the concept that computer processing speed can be viewed as a factor impacting nurses' utilization of e-mail:

..as she mentioned, it's pretty frustrating, and you've got to wait hours and hours...not hours, but I get impatient after a while, because you see the different systems at home or wherever, and it's like you're waiting for minutes and minutes and all of a sudden you get kicked off the system.

d. Hardware and software compatibility. Hardware and software compatibility between e-mail systems was a major issue identified by participants in all three groups. Problems reading and sending mail attachments due to incompatibility of software were recognized as barriers to the use of e-mail. Feelings of frustration were verbalized as many

worked in institutions where not all the systems within one facility were compatible with one another. The following comments characterized this subheading:

I don't get attachments, I don't get things. I just hate using it (e-mail) here.

Universal translators aren't universal.

..some of the reports that I generate, communicating to my superiors or just generate to other folks, it's kind of an easy way to do it. Unfortunately, I don't do it as often lately because I've had problems from the receiver saying, well, you know I couldn't get the attachment to your message.

A system's ability to distribute detailed data and send documents was cited as a facilitator to use by members of all three groups.

e. Printing. Members in all three groups mentioned that printing capabilities of a system influenced their use of e-mail. Lack of a printer attached to the e-mail system was the most obvious barrier identified but there were several others. Poor quality printers, shared printers, and the inability to select individual messages to print were all negative factors recognized by the participants. The following statements substantiate these barriers:

My printer is so frustrating for me because it jams, it eats the paper, it gets stuck, and it keeps printing on top of itself until it burns a hole in the paper.

I want to be able to print off it. I can't get this thing to print most of the time, half of the time...you can't even print just one e-mail. If you've got 50 e-mails and you want to print, it'll print out all 50 e-mails.

Many faculty group members had negative experiences with shared printers. Several individual problems were identified: distant locations from work area, lack of security for information being printed, and maintenance of the printer and needed supplies.

Individual desk-top access to a printer was identified by almost all participants to be important. One participant, however, stated she virtually never used printing, preferring instead to save information in files on disks or hard drives. The quality of the printer was also a factor, as most participants preferred systems that utilized laser printers over dot matrix printers. The ability to select the individual messages to print was also cited as a facilitator to e-mail use by those in the student and faculty groups. The following statements verify these factors as facilitators:

I would go crazy if I didn't have my own printer.

Maybe one percent of the time you print, but when you want it you want it.

...it just makes all the difference in the world being able to not only print out things that I want printed out...

Laser printer is a lot easier to read.

I want the ability to select, choice, and an icon.

f. Special features. There were several specific features of e-mail systems that were identified by the group participants to impact e-mail use. Several of these had a negative and positive component; the absence or presence of this special feature affected use. The following features were desired capabilities of e-mail systems: maintain address books, create distribution lists, certify mail, and easily save and delete messages. Certifying mail was explained by participants as the capability of an e-mail system to record when a message was sent, when it reached the receiver, and when the receiver accessed that particular message. The following statements support the value of each of these features:

I hate typing in the address every time, I'm afraid I'm going to make a mistake on it, and it's a pain

...if there were things that I'd needed to know they had read and when they read it, it had an option for certified. So you knew when they read it, and you could also kind of track or informally track who's using their e-mail.

So it's easy to communicate with a big group because I can put everybody's name in a list and make a distribution list and just type one word in and then I hit all those people.

Not each individual group member had experience using systems with each of these features, but among those that did, there was general agreement that these features facilitated use.

4. Security Issues

Security issues was a broad category that included participants' comments about individual and network passwords, opinions and thoughts on privacy and confidentiality. Therefore this category was broken down into two subheadings: passwords and confidentiality. Content analysis of discussion related to these topics also identified barriers and facilitators. In some cases, the facilitators were actually adaptations to the barriers perceived to have been present by the individual.

a. Passwords. All three groups had lengthy discussions about passwords with conflicting opinions represented. Most of the debate centered around the issue of systems requiring individuals to frequently and routinely change their password for their individual e-mail accounts. Numerous participants vocalized frustration at having to frequently change this

password. The biggest problem cited was the difficulty in remembering passwords. For example:

I don't like that (changing passwords). That frustrates me.

If they want us to use e-mail they ought to just have one code, period!

I don't remember my wife's name half the time, so I call her Honey. She thinks I'm affectionate.

Although many voiced frustration, several of these conceded they thought it was a necessary security measure. The following comment from one of the participants in the student group summed up this sentiment:

You've got PINs for ATM, PINs for credit cards. I have a PIN to get into my garage, I have a PIN for my alarm system...have a password here, a different password for...sick of having so many passwords, but you have to, you don't want to have, okay-here is the universal key...

The hospital group also recognized that having to write down the password to remember it compromised the security that passwords were designed to protect. Several problems were also identified with the process of obtaining new passwords. The requirement to choose an individual's password from a preselected list of passwords was viewed negatively. Many participants in the hospital group also described the process of obtaining a password as cumbersome and a waste of time. The institution they worked in required them to physically leave their work area to be issued a password. The following comments support this as a barrier to use of e-mail:

...they change your access code every so many months, and then you go to use e-mail again, and your code changed, and then you can't get a new code. You have to go downstairs to get it, and it's barely open for so long...

I have not used it for more than six months, and I tried to get back into it one time and I couldn't because it had already expired or long expired...

Interestingly, not all group participants felt the same about passwords. All of the participants in the faculty group believed that individual network passwords, in addition to a password to their individual e-mail account, should be a necessity. They disliked the fact that the present system they operated in did not require network passwords. Although the majority of participants voiced frustration at changing passwords, there were several individuals who were in favor of systems that required frequent password changes. The following comment from a member of the faculty group validated this train of thought:

I think you need them (passwords). I think you're a fool if you don't have one and you don't change it frequently.

All three groups discussed the fear of sabotage if individual passwords were not protected. Although no-one shared a personal experience, many shared stories they were aware of:

I don't want anybody to know my code because you could send somebody something that's illegal or something that's bad, and you're using my code, and it's under my name.

Yeah, I guard my password...It's like you're always paranoid someone's looking over your shoulder...Because I've heard horror stories where someone has e-mailed the president and has sent threatening notes and, of course, trace it back to you, and the OSI's (Office of Special Investigation) on your doorstep with handcuffs. Confidentiality is another issue...I know of some instances where people have had their e-mail, I don't know what word to use. Sabotaged? Someone else has accessed their e-mail and sent out very inappropriate messages.

The ability to customize individual passwords was recognized as a facilitator by several group participants. For example:

I think I prefer systems that allow you to choose your own password rather than make you choose or use the one that they choose, because it is not always easy to remember.

b. Confidentiality. Despite the fact that most of the discussion related to security centered around passwords, there were several other topics discussed within the focus groups. A few members of the hospital group were frustrated by what they perceived to be an exaggerated sense of privacy. They did not feel e-mail communication warranted so much concern about security. For example:

Why does it have to be so secret in the hospital? Why does it have to be, you know, like we have clearance or something.

I've never gotten a message that I wouldn't want someone else to read.

I mean I tell people, 'Oh, you can use my code.' You know, if I know them...

Several members of the student and faculty groups mentioned there were many times they, or others they knew, just did not think about security issues. For example:

It (e-mail) is insecure com. We don't always think of that. A lot of times you think you're sending it to person X and it's going to person X, but how many hands does that go through, or how many hands have potential access to that?

I don't care. Once it's out of my fingers I don't know how it works out there.

A member of the faculty group believed this lack of thought was due to a lack of education, as the following comment demonstrates:

That's a concern I have is that for some they are not aware, and the implications of that from a risk management background. I am just real concerned that maybe we don't do enough education of that sensitive confidentiality issue.

Several members did however voice a concern about the possibility of uninvited access to their computer's hard drive. One member of the student group even identified this as one of the reasons she chose not to set up an e-mail account on her home computer. Another member also identified this as the reason he had two separate home computers. For example:

That's why I have two computers. On my computer that I have my e-mail, I don't have any information that I would care if the whole world saw. Like, you know, financial stuff. On my other computer that I don't use routinely for e-mail I have all my financial stuff. Just because of that reason.

Another security barrier identified to hinder utilization of e-mail was the use of shared computer terminals and printers. For example:

...some things that come particularly from students, I really don't want coming through a common printer down in a room where someone else who's waiting for their job could read the communication.

I have to go around to the different terminals that are free or open, and or course, I'm sitting out in the open with someone else waiting to get access behind me for reading lab data or something.

As a way to deal with the fear of a system's integrity being compromised, many participants operate under the assumption that the system is not confidential. Although content analysis labeled this a facilitator, it may not directly facilitate e-mail use but is an example of an individual's adaptation to the perceived barrier that the system is not secure. The following comment represents this train of thought:

I just presume that everything I do on the computer can be accessed by just about everyone, and if I don't want it accessed, I don't put it on the computer I try to be careful of what I say, how I use it, and what goes out where, because I'm sure somebody will retrieve it elsewhere, and it will come back to haunt me some day if I ever used it inappropriately.

5. Individual Instruction

This category included all references to any formal or informal education individuals had relating to e-mail. This category also included discussion about the type of instruction individuals desired. Once again, content analysis of these discussions identified barriers and facilitators that impacted nurses' utilization of e-mail.

The biggest barrier identified by the focus group participants was the lack of a formal course on e-mail. None of the faculty group or hospital group participants had e-mail training as an official part of their job orientation. With the exception of the faculty group, this was often the reason participants did not use a particular e-mail system. For example:

...but their new system, either I didn't learn how to use it, which we never got instructions.

That's another disadvantage, if you don't get instructions.

When I was at Wilford Hall (hospital) they just said use e-mail and I never had any training at all which was a barrier to me.

So I think training is a very important thing to make it user friendly that you know how to use it and you're familiar with it. You know, the example of driving a car. Just because you learn how to drive an automatic, doesn't mean you can go out and drive a standard.

Several participants also recalled that instruction was not provided to existing e-mail account holders when e-mail systems changed or upgraded. The following comments attest to this as a barrier to utilization of e-mail:

Yes, I took the initial class they had here. CHCS and Team Links, but then again, that was a year-and-a-half ago and already they had come out with one if not two versions and upgrades...I don't even have a new book to look at.

I think what happens is that people assume that you know e-mail or you use e-mail, and if they change a system on you and then think that you will be able to use that system.

Several members who had attended e-mail classes stated it was difficult to remember the instructions, particularly if they used the system infrequently. The following comments substantiate this as a barrier to utilization of e-mail:

I don't use it often enough that I can remember all the commands and everything else that goes with it. How to send out, and sometimes even how to get it, how to erase it, how to keep it, anything. I just quit using it!

So I kind of learned the e-mail thing, but then I never had time to go into the e-mail, and then I would forget how to do it.

It's like if I give you training because you drive a car. If you don't get out there and drive that car and do it periodically, you're not going to be able to drive that car, and the same thing with any kind of program.

Participants also referred to a lack of written instructions or online help as an obstacle to using e-mail.

The focus group participants identified system-specific instruction as one of the greatest facilitators to using e-mail. Even those participants in the hospital group who identified themselves as non-users conceded that they would probably use e-mail if they had received some type of system-specific teaching. The following comments validate education as a facilitator to e-mail use:

Yeah, I think that's the big thing. I think everybody needs to be educated and have plenty of training and practice and hands-on.

Because I was, you know, hit and miss just learning as I could from people that knew different things, and then when the systems guy came up and was able to teach me, that made all the difference in the world.

Members of the faculty group also referred to the importance of system-specific training for new faculty as they came into the university because every e-mail system is different.

Although not many of the participants had attended formal e-mail courses, there was a lot of discussion about what they would like to have received. Classes with hands on training were desired. Progressive courses that included advanced features at a later date were recommended by those in the student group and the hospital group. Participants in each group also mentioned that an easy manual available for future reference facilitated use. A member of the student group also mentioned that an on line help feature was important. For example:

Instructions make it easier. While you're in that application. If you have a question, right then and there, there's a help thing that you can do, and you don't have to go searching through pages.

As mentioned previously, many participants stated they had no formal training. Most learned from knowledgeable coworkers and friends. This informal education was considered invaluable to those who wanted to use the e-mail systems. For example:

I learned mine by having a friend sit down and/or buying the whatever it is for dummies books. Those are a lifesaver, so everything I learned is either from somebody just helping me or my getting a book like that.

Mine (training) was grabbing my NCO and saying, "Show me how you do this", because she did it all the time.

We went to the class...and it was kind of helpful, but I mean they would go really fast, you know, in the class that I would catch some of it and some of it I didn't, you know. So then I would have to come back and just learn it, and then ask somebody else how do you do this? So finally I would learn that.

One of the participants also identified how important this informal instruction was from the point of view of those actually mentoring others:

We need to mentor people to help them see how easy it is to use and how much it will help them and all these different benefits that we see in using it, and I think if we mentor people that it will help the evolution along quite a bit instead of just saying here it is. You know, use it.

6. Access

The focus group participants talked a great deal about access and how that issue related to their use of e-mail. For content analysis, this category was further divided into two subheadings: (a) physical access to a computer and (b) reliable access into the e-mail system. Both of these also had negative and positive components.

a. Physical access to a computer. Access to a computer was a big issue impacting e-mail use for the faculty group and the hospital group. Many participants stated there were not enough shared computers in the work environment for those who needed to use them.

For example:

For me, speaking as a nurse manager, I have access. I think for the nurses working on the floor, they do not have access...The staff nurses, in my opinion, they have a bad time...they don't have access to a computer. There's one computer for my whole floor to use.

I think it is an issue that if you buy into this kind of way of doing business, then everybody needs to have access, and we're not at that point...I think some faculty perhaps would like to have better access.

I know in the _____ at Wilford (hospital) there's 60 some odd nurses who have e-mail

accounts, and every office has a computer, and maybe there are five offices, but there are people working on those computers all day long, and there's only one terminal for everyone else to go look up their mail.

One of the participants in the hospital group also noted that obtaining access to a computer was more difficult during day shift due to more people being on the unit. Working nights facilitated access to a computer terminal.

Members of the faculty group also noted other problems with lack of individual desktop access to a computer terminal. For example:

...even if it's just not having it right on your desk, even if it's just down in the mail room or the faculty lounge, still you have to make a separate trip to be somewhere else, and so it loses some of the value of timeliness.

This opinion was supported by participants in the hospital group who also mentioned that it wasted time having to search for an available computer to use. There were also several participants who were concerned about privacy when their access to a computer terminal was in a central location.

Individual desktop access to a computer was recognized by the participants to be a facilitator to the use of e-mail. In summary statements, many of the participants included access as one of the things they would change to increase use of e-mail. Those that had desktop access to e-mail felt strongly this contributed to their utilization of this electronic form of communication. For example:

I have access to a computer, and I can look at my e-mail anytime.

...it (desktop e-mail) was part of my package for negotiation, It was a deal breaker.

I just recently have it (desktop e-mail), and believe me it makes a world of difference not to have to get up and go to the computer room and then get there and realize, oh, I forgot my book to mark this down...it's just really wonderful to have it on the desk.

b. Reliability of access into e-mail system. Access included not only physical access to a computer but the issue of access into the e-mail system. Many participants recalled problems with the computers not working and network systems malfunctioning. All of these prevented individuals from accessing their e-mail accounts. For example:

The computers that we have on our floor, they don't even work half the time. I mean you can't even get into e-mail. It's like down...I think the system's down.

There's one at our nurse's station, but that doesn't work half the time. The computer itself doesn't work half the time.

The main problems are just when there's a bug in the university computer system. For some reason you can't access, and you can't figure out why ...

Other participants mentioned that attempts to access their e-mail account during periods of high use were a waste of time. For example:

I found out here that the morning, as soon as I get in like around 7:00, it's much quicker than if I tried the afternoon. I can sit there and see the hour glass for minutes and minutes and minutes. I walk away and come back and still the same.

Members of the faculty group also mentioned they were aware of some organizations that restricted certain personal uses of e-mail. This was considered to be a barrier since one e-mail system could not be utilized for all the different types of communication an individual desired to complete.

The student and faculty groups also noted that for many e-mail systems, it was difficult and cumbersome to access their e-mail account from a distant location. Several felt an easier process, one that would not cost anything for the individual, would facilitate e-mail use. As mentioned earlier, it was noted that there are times to access e-mail accounts that are more convenient than others. Several members felt accessing the system during periods of low usage, early mornings or nights for example, also facilitated use.

7. Support

This category included references made by the participants to two very different types of support and therefore content analysis identified two separate subheadings: (a) technical support and (b) administrative support. Once again, each subheading had positive and negative details.

a. Technical support. Technical support was understood by the participants to be any type of assistance they received when they encountered problems with their e-mail system. Not all of the participants in the student group were aware of the different types of technical support available to them but stated they had all required this type of help at some time. The hospital group members were all aware that technical support existed from their institution and many recited the phone number from memory. Even one who had labeled herself a non-user had attempted to call this support office. Members of the faculty group, on the other hand, stated they did not have the need for assistance from a technical support office to maintain their use of e-mail.

There were several problems about technical support identified by the participants. Some mentioned that there are times that the support personnel are not able to understand the problem over the phone. For example:

Most of the time (they're helpful). If you get someone who can kind of...Because a lot of them, they don't really know what you're talking about, so you have to explain it.

Where some of them they know pretty much. All they ask is a couple of questions. But some of them, if you don't ask a very specific question they're not going to help...

Others experienced situations when the support personnel were busy with a major system malfunction and were unable to help them with their individual account problem. Lack of support when attempting to access e-mail from a distant location was also mentioned to be a problem. Content analysis labeled these problems barriers to e-mail use.

Twenty-four hour availability of technical support was identified by many of the participants to be a very important facilitator to their use of e-mail. Several members of the student group who had their own e-mail accounts at home had specifically chosen to set up accounts with companies that offered 24 hour free technical support. For example:

In fact, I chose the more expensive system, ...because ____'s technical support at the time was a long distance phone call...So I chose ____ which was a local telephone call, and as I expected, I used them initially a lot, and I still continue to use them fairly frequently.

In addition to these formal technical support services, many of the participants identified that they had sought out technical help from knowledgeable friends and coworkers. The fact that these individuals were usually easily accessible facilitated their use in this capacity. For example:

Yes we had it (technical support), and yes they did help me if I had a specific question, but more frequently I just asked other people.

You know, there was always somebody else who was real spiffy in e-mail if they were on shift. You knew there was always somebody around, but it wasn't a system. It was a happenstance. Hey you. Help me here, would you? When I first came aboard I would just grab folks.

b. Administrative Support. There was another type of support discussed at length by the participants in the faculty group. They recognized the need for administrative support as a facilitator to the use of e-mail. When this administrative support was lacking within an institution, it resulted in several barriers to individual's use of e-mail. The following statements substantiate this category:

...I think this would be applicable to a workplace environment, as well as a university environment, is that my feeling is that very often the administrators, and the higher up the administrator, the less personal experience they have with computers and perhaps the more resistant they are toward putting the up-front costs into the things we've talked about which are computers and printers on everyone's desk. Easy access, the convenience things that make people want to use it.

I think that if there's an expectation either that the faculty or the students use e-mail, then the support has to be there, up to and including compatible equipment on everybody's desk, and this means big bucks for upgrading the equipment because things do become obsolete and need replacing.

With the continued obsolescence and the need to upgrade, if not the computers themselves, at least the software, it is a tremendous cost to have a system that works efficiently and works consistently...Now the computers are an expectation. So I think anyone who was starting a system would need right off the bat is a very distinct commitment for resources from administration.

C. Limitations of the Study

Since this study utilized focus groups as the primary method of data collection, the generalizability of these findings to all groups of nurses is inappropriate. This type of external validity is replaced in qualitative research by the concept of transferability (Lincoln & Guba, 1985). Transferability is the responsibility of the researcher who uses these findings elsewhere. To aid in the task of determining transferability, the following information must be noted about the individual focus groups' composition. Although the student group participants were all graduate nursing students, coincidentally they all were also active duty military nurses. Three branches of the service were represented. Despite attempts to recruit more participants than needed for each focus group, the faculty focus group ($n = 4$) was much smaller in size than originally planned. Several faculty who had indicated they would attend did not. This small population size limits the effectiveness of the design that required each focus group to be held with a different population of nurses in an attempt to overcome the limitation of single institution sampling. It should also be noted that the hospital focus group included not only active duty military nurses, but a civilian nurse employed at that institution as well. The limited number of subjects from each of these settings limits the transferability of the findings.

The focus group participants represented a purposive and self-selected sample, factors which have been recognized to be a source of bias (Haber, 1998). The problem of bias is related to the fact that the focus group samples tended to be self-selecting following the receipt of an invitation letter. Although several individuals volunteered to participate, the researcher obtained information only from those who actually came to the focus groups. The question must be asked what kind of data would have been obtained if all the invited subjects had responded? What motivated some to participate and others not to participate? Although attempts were made to invite a combination of e-mail users and non-users to participate in the groups, of those who chose to participate, the majority were e-mail users. Only 6% (n = 1) of the study population indicated they never use e-mail, 12% (n = 2) categorized their use as infrequent, while 82% (n = 14) indicated they used e-mail almost every day in the workplace. Therefore the investigator was not able to overcome a previous study's limitation that had included only e-mail users as subjects (Sands et al., 1993). These findings may not represent many barriers and facilitators unique to e-mail non-users.

The list of barriers and facilitators generated from these discussions may not be representative of the feelings of the group (Carey, 1994). Brink (1989) points out that participants may wish to appear socially acceptable and may censor their responses. Participants' inclination to go for consensus rather than argument represents one of the dangers in focus group research. However, there were several factors identified within these focus groups that did not have group consensus, leading the investigator to conclude the participants were able to raise unpopular issues in the group. Furthermore, consistency is assessed by how the findings

compare with other evidence (Brink, 1989). This study's findings provided support for most of the limited evidence available.

V. DISCUSSION

A. Overview

The purpose of this study was to identify factors that impact nurses' utilization of e-mail in the workplace. Increasing nurses' utilization of e-mail is considered necessary because it could affect nursing practice, education, research, and administration (Magnus et al., 1994; Staggers & Parks, 1993; Staggers, 1996). A qualitative research design that utilized focus group interviews as a method of data collection was successful in identifying seven categories of factors that impact nurses' utilization of e-mail. These seven categories were identified through content analysis of the focus group transcripts. The findings of the study also identified numerous individual barriers and facilitators. This discussion will elaborate on each of the major categories in light of this study's theoretical framework.

B. Theoretical Framework

The findings of this study demonstrate the partial usefulness of applying Rogers' (1983) theory of innovation diffusion to assist in identifying the factors involved in nurses' use of e-mail. Factors identified through content analysis closely resemble four of the major concepts in Rogers' model of innovation diffusion: characteristics of the adopter, organization, innovation and communication. When focused on the use of e-mail by nurses, the factors translate into characteristics of the nurse, the organizational setting, the e-mail system, and how the concept of e-mail was communicated. However, Rogers' theory is amplified in this research project in the sense that more than four categories were identified to impact the adoption of e-mail. The categories identified to impact nurses' use of e-mail differed in number and composition from the concepts identified by Rogers to affect diffusion of innovations.

Although several categories related closely to the major concepts proposed by Rogers (1983), they were identified, by their composition, to mean something different. More detail appears to be necessary in order to apply Rogers' diffusion model to the technical innovation of e-mail. However, the seven categories identified to impact nurses' utilization of e-mail fit within the four broad concepts of Rogers' theory (Table 4).

Table 4

FACTORS THAT IMPACT NURSES' UTILIZATION OF ELECTRONIC MAILCHARACTERISTICS OF POTENTIAL ADOPTER*

- Perceived disadvantages/ benefits of use
- Individual personal traits

CHARACTERISTICS OF THE INNOVATION*

- Technical capabilities of system
 - Quality of interface
 - Volume of messages
 - Computer processing speed
 - Hardware and software compatibility
 - Printing
 - Special features
- Security issues
 - Passwords
 - Privacy

CHARACTERISTICS OF COMMUNICATION CHANNELS*

- Individual instruction

CHARACTERISTICS OF THE SOCIAL SYSTEM OR ORGANIZATION*

- Access
 - Physical access to computer
 - Reliability of access into e-mail system
- Support
 - Technical support
 - Administrative support

* Components of Rogers' (1983) Innovation-Decision Model

Rogers (1983) did not single out time as a factor that influenced the extent to which an innovation is adopted, pointing out instead that time does not exist independently of events, but is an aspect of every activity. The findings of this study supported that premise about time as many of the individual barriers and facilitators identified within each category related to some aspect of time. For example, activities and situations for which participants lacked the time or considered as wasted time were described within the following categories: individual personal characteristics, volume of messages, access, security issues, technical capabilities of system and perceived disadvantages/benefits of use. Activities related to saving time were identified in the following categories: perceived disadvantages/benefits of use, technical capabilities of system, access, and support.

Rogers' (1983) model of the innovation-decision process will be utilized as an organizing framework for the following discussion that will elaborate on each of the seven categories identified in this study to impact nurses' utilization of e-mail. The relationship of each of these categories to the concepts in Rogers' model will be expanded upon.

C. Characteristics of the Potential Adopter

In Rogers' model of the innovation-decision process, characteristics of the decision making unit (or potential adopter) include three subheadings: socio-economic characteristics, personality variables, and communication behavior. This study identified a category with similar properties. The category, named individual personal traits, included an individual's demographic variables, education, opinions, motivations, learning styles, past experiences, nursing positions and computer skills. However, this study identified a second category related to characteristics of the potential adopter: perceived disadvantages/benefits of use. Relative advantage is a factor Rogers included in his model under the umbrella of characteristics of the innovation. The

participants in this study discussed most of this topic by introducing personal value statements about the perceived benefits or disadvantages. Thus, relative advantage was much more characteristic of the individual than of the innovation itself in the present study.

1. Perceived disadvantages/benefits of use

The focus group participants' statements are consistent with the findings of Sands et al. (1993) who reported a direct positive relationship between individuals who used e-mail and two variables: (a) belief e-mail was useful for sending information and (b) belief e-mail made their lives easier. This study's research design did not include direct observation of e-mail use but solicited self report of e-mail use. The fact that an individual's perceived disadvantages and benefits related to e-mail were found to affect its use also supports Chang's (1984) research that found nurses with favorable responses and expectations of computers were more willing to interact with computers. Many of the benefits described by the focus group participants in this study were benefits identified in previous nursing and non-nursing studies. Only one focus group participant was unable to identify any benefits of using e-mail, and she had described herself as a non-user.

Although several disadvantages were identified by many of the participants, they were often not sufficient to prevent the nurse from using e-mail altogether. There were times that e-mail was not considered an appropriate medium for communication and was not used. This is consistent with an inverse relationship identified in Rice's (1987) review of non-nursing studies which demonstrated that as communication was perceived to require more social presence, the use of electronic messaging was decreased. Updegrafe (1991) also cited inappropriate e-mail use as one of several potential barriers to utilization of e-mail in an educational setting.

Lack of face to face communication in e-mail is a newly identified variable; it had not been mentioned in previous studies or articles relating to e-mail in either a positive or negative context. However, this factor was viewed as both a barrier and a facilitator to use of e-mail for the purpose of conflict management by this study's participants.

It is interesting to note that each subject assessed disadvantages and benefits in terms that were very specific to their individual circumstances. Systems vary considerably, thus, depending upon circumstances, use of e-mail may be an advantage for a particular user or may be a burden for others. When asked about disadvantages and benefits to using e-mail, participants did not respond with a rote list; instead each made personal value statements about many of the perceived benefits or disadvantages. Thus, in this particular group of nurses, e-mail use is affected by an individual's perception of the benefits or disadvantages of this technological innovation in a particular circumstance.

2. Individual personality traits

Comments of participants in this study about particular positions in nursing affecting use of e-mail contradict Ngin and Simms (1996) who reported mean scores for e-mail use that were higher for clinical nurses than nurse managers in their previous study. The focus group participants in this study had the opposite experience, with many pointing out that it was very difficult for a staff nurse to use e-mail. Participants stated it was much easier for nurses in nursing management positions due to increased access, more time to use the system, and the fact that more management functions are applicable to e-mail. Several factors that may differentiate the two groups may be at play here and were not individually explored in depth in this research project. Age, time and access, all of which were raised as separate issues, are probably factors which confound the issue of position in nursing.

Lack of time to use e-mail was mentioned as a barrier by study participants, particularly as a problem for staff nurses. Insufficient time was also cited by the subjects in Staggers' (1994) study as one of the reasons they chose not to use computers. Rice (1983) does not mention time specifically but refers to the fact that a user's position level or job description influenced adoption of computer mediated communication systems. This supports the claim that it may be more difficult for staff nurses in general to use e-mail.

Individual traits were identified as barriers. Lack of typing skills was described as a barrier to the use of e-mail by the focus group participants, supporting the same claim made by Updegrove (1991). Lack of individual writing skills surfaced as a barrier from the student focus group discussion. Writing skills is a new variable not previously identified in any other studies as a factor that could impact the adoption of e-mail.

Several participants observed a negative relationship between age and e-mail use of co-workers. In their experience, the older an individual was, the less likely they were to use e-mail. Several previous studies point out age affected individuals' use of computers (Rice, 1987, Staggers & Mills, 1994). Rice's research review noted that age is negatively associated with acceptance and use of technological innovations, claims consistent with this study's findings. Staggers and Mills demonstrated that age was directly related to computer performance outcomes but did not attempt to demonstrate a relationship with frequency of use. Timing of educational preparation was also a trait identified in this study as having an impact on nurses' use of e-mail. However, focus group participants had mixed experiences with recently educated coworkers. Some felt attending school within the last four years was a facilitator to nurses' e-mail use while others stated they did not observe this effect. No previous studies attempted to measure this variable.

Study participants recognized that some nurses were intimidated by or afraid to use e-mail. Staggers (1994) also recognized this fact when she included the following selections in her questionnaire designed to solicit reasons nurses may not have used computers in the past: (a) personal anxiety caused by computers, and (b) fear of losing files or information. Several participants in this study used the term antitechnology when describing individuals who did not use e-mail.

Prior computer skills were identified by the participants in the student and hospital group as facilitators of e-mail use. This finding is consistent with several studies that examined nurses' use of computer information systems (Ngin & Simms, 1996; Staggers, 1994; Staggers & Mills, 1994). The members of the faculty group, however, denied these claims. They stated e-mail is such an easy computer application to learn, it did not require existing computer literacy.

There was general agreement between the groups that an individual's perceived expectation that they were to use the e-mail system could facilitate use. This claim supported study results of Golden et al. (1992) that noted subjects who reported formal and informal pressure to adopt an e-mail system had significantly higher usage rates. There were also several participants who mentioned the importance of e-mail as a tool of the future and believed it was soon going to be an "essential competency" of every nurse. This replicates the claims made by Staggers (1996) and Magnus et al. (1994) that nurses must utilize e-mail in order to continue to increase their professional productivity.

Thus, the nurses in the present sample observed that use of e-mail was impacted both positively and negatively by several individual personal traits. Their concerns centered around an individual's position in nursing, their motivation, and existing computer skills.

D. Characteristics of the Innovation

The innovation itself is one of the four main elements identified by Rogers (1983) in his diffusion of innovation theory. As described earlier, he identified five specific characteristics of innovations that affect their rate of adoption: (a) relative advantage, (b) compatibility, (c) complexity, (d) triability, and (e) observability. Discussion from the focus group participants demonstrated that each of these was an important characteristic of the innovation itself except one: relative advantage. In this study, relative advantage was labeled as perceived disadvantages/benefits of use and found to be a characteristic of the potential adopter, not the innovation itself.

Focus group participants discussed security issues directly in relation to the innovation of e-mail. Interestingly, Rogers' (1983) diffusion of innovations model did not identify security issues as a factor impacting innovation adoption. E-mail is a relatively new technological innovation and this may contribute to the fact that the process of electronic communication is often poorly understood. Possibly, this is part of the reason the issue of security and confidentiality were expressed as a concern in this study. Hence, content analysis of the focus group transcripts identified two separate categories that fit under Rogers' umbrella of characteristics of the innovation: technical capabilities of the system and security issues.

1. Technical capabilities of the system

This category included the following topics: quality of interface, volume of messages, system speed, hardware and software compatibility, printing, and special features of the system. The participants in all three focus groups had strong opinions about many of these topics and there was general agreement within and among the groups about which aspects were barriers and which aspects were facilitators. Technical capabilities of the system were mentioned early in

each group, thus supporting Rogers' claim that the qualities of an innovation are one of the most important characteristics affecting rate of adoption of the innovation (1983). Previous nursing and non-nursing literature also supported this premise. Dillon et al. (1994) described quality of the interface in terms of how convenient and easy a system was to use and reported it was one of the factors influencing nurses' decision to adopt or reject a computer information system. Staggers and Mills (1994) also identified certain computer characteristics that affected nurses' interface actions: processing speed, keyboard height, screen tilt, furniture design, and mouse vs. keyboard cursor keys. Only two computer characteristics, the mechanism for interaction with the e-mail system and the computer processing speed, were recognized by the focus group participants in this study as having an impact on use of e-mail. No mention was made of furniture design and computer ergonomics.

The lack of a printer had previously been identified as a barrier to nurses' use of computer information systems (Ngin and Simms, 1996). The present study supported this finding and further revealed that, not only was access to a printer important, but individual desk-top access to a printer and print quality were very important. Updegrove (1991) also noted that failure of the total work group to be connected via a network and overly complex systems were potential barriers to e-mail utilization. Participants in this study praised user-friendly e-mail systems while criticizing systems that were extremely cumbersome and difficult to use. Participants often chose not to use the system at all if it was perceived to be too difficult. One of the biggest frustrations voiced by study participants was the inability to send or receive files as attachments to their e-mail messages; a problem related to software incompatibility between e-mail systems.

There was nothing in the literature reviewed about the volume of messages that individuals received although this was a subject expressed by many focus group participants to affect their e-mail use. Many systems do not provide the alternative of a bulletin board for common messages. Thus the consensus for this group centered around the ease of use of the system. When the e-mail system did not require special effort or did not disrupt the work day routine, e-mail was viewed in very positive terms.

2. Security issues

This category included participants' comments about individual and network passwords, and their opinions and thoughts on privacy and confidentiality. It is surprising that there has been so little written on this topic, specifically related to e-mail, in the reviewed literature. Password integrity and fear of uninvited access to one's hard drive were undeniable concerns for this study's participants and impacted the way they interacted with e-mail and with computers in general.

Specific security concerns were related to how individuals viewed the content of messages sent via e-mail, whether they believed e-mail was an appropriate medium to use for that specific communication, and their perceived risk of sabotage. General group consensus was that frequent changing of system passwords was necessary but that the process should be simple and not require a lot of time or effort.

E. Characteristics of Communication Channels

Rogers (1983) describes communication channels as the means by which messages are communicated from one individual to another. He refers to mass media channels when talking about transmitting messages through a mass medium that allow a few individuals to reach an audience of many. Interpersonal channels, on the other hand, involve a face to face exchange

between individuals. Rogers postulates that interpersonal channels are more effective in persuading an individual to adopt a new idea especially if the interpersonal communication channel involves individuals who are peers. This study also identified a similar process: how the concept of e-mail was communicated to potential adopters impacted their decision to use or not use the innovation. The related focus group discussions were labeled under the category named individual instruction.

1. Individual instruction

Within the category of individual instruction, statements were included about any formal or informal education individuals had relating to e-mail. This was one of the most prominent factors identified by the focus group participants in the student and hospital groups as affecting their e-mail use. Many participants cited a failure of their work or school organization to provide any type of formal instruction on the use of their particular e-mail system. Several relied on coworkers and friends to informally provide them some basic information. Although several participants in this study still used the systems, they did not feel like they were efficient in doing so. Many participants who had worked at various institutions compared training programs and institutional policies and tended not to use e-mail within the institutions that did not provide formal e-mail courses. These findings support Staggers (1994) research that also identified lack of formal computer training as one of the reasons nurses did not use computers.

The fact that many participants still used e-mail systems despite a lack of formal training may also support Rogers' premise that interpersonal communication channels are more effective than mass media channels in persuading an individual to adopt an innovation (1983). Many of this study's focus group members had sought out informal instruction from knowledgeable friends and coworkers. Rice's (1987) research review also supported this claim by pointing out

that a potential user's interpersonal network will influence adoption of a computer mediated communication system. According to Rice, peers provide social information about using a system and also role model adoptive behavior. Rice also reported that computer communication system users preferred to learn new systems from their peers, pointing out that introductory seminars did little to influence behavior.

Not only was initial instruction identified to be important, but education when systems were upgraded or changed was considered necessary by this study's participants. In addition, many desired some type of system-specific written manual they could use as a reference when attempting to use e-mail independently or use features they did not use very often.

It is interesting to note that the consensus among the majority of this study's participants was that system-specific e-mail instruction made a big difference in their use of e-mail. Several had pointed out that instruction and access were the two most important factors affecting their use of e-mail. However, there is little in the reviewed literature that reflects this influence of education related to an individual's adoption of a technological innovation.

F. Characteristics of the Social System or Organization

Rogers (1983) states that diffusion of an innovation occurs within a social system. The social system is a boundary within which an innovation is permeated. Rogers characterizes the units of a social system in the following manner: individuals, informal groups, organizations, and/or subsystems. The results of the present study identified two units within a nurse's social organization to impact use of e-mail: access and support. Access issues included physical access to a computer as well as reliable access into the actual e-mail system. Support included technical as well as administrative support.

1. Access

Access was identified by this study's focus group participants to be a major factor impacting their use of e-mail. This finding supports previous nursing studies and non-nursing literature that reported lack of desk-top access to a computer was a barrier to use of computer systems (Ngin & Simms, 1996; Rice 1987; Staggers, 1994; and Updegrove, 1991). Rice's research review expanded the definition of access to include not only physical access to a computer but reliability of the system as well. Some focus group members who had access to a computer still encountered problems accessing their e-mail account due to network system malfunctions or periods of heavy use. Most of the participants, however, developed strategies to overcome these potential barriers. They could not as easily overcome the obstacle of lack of computer access.

Thus the common concerns of this study's sample centered around physical access to a system. When obtaining access to a computer required special effort, a lot of time, or required nurses to leave their immediate work environment, they were much less likely to use e-mail routinely or to view use of e-mail in positive terms.

2. Support

This category included statements referring to technical support as well as administrative support and was one of the categories identified by the focus group participants to affect nurses' utilization of e-mail. Previous research (Ngin & Simms, 1996) supports the finding relating to administrative support but the reviewed literature reported nothing about technical support in relation to use of e-mail or computers. This is interesting to note since technical support, rather than administrative support, was a more pervasive concern among this study's participants. Formal institutional technical assistance was desired and had been utilized by all of the focus

group members except some of the faculty group. It is important to note, however, that even when formal technical support existed, many participants relied on knowledgeable peers and coworkers for technical assistance.

Issues of administrative support centered around an administration's financial commitment to purchasing and providing equipment to include individual desk-top access to computers and printers. Participants also suggested it was an ongoing administrative responsibility to maintain the equipment and provide hardware and software upgrades when indicated. Interestingly, the faculty group were the only participants who discussed this issue in detail. A previous study utilizing nursing faculty as subjects had also specifically identified lack of hardware and lack of software as barriers to faculty use of computers (Lewis & Watson, 1997).

Thus a consensus among this study's participants was that specific characteristics of one's organization and social system can impact an individual's use of e-mail. Their concerns concentrated on the types of support they perceived to be available to potential e-mail adopters.

G. Implications for Nursing and Future Research

The information obtained in this study could be beneficial to anyone introducing or updating an e-mail system within an organization that employs nurses. The specific barriers and facilitators uncovered in this study should be used as benchmarks for choosing and implementing a system. Relying on the information obtained in this research project, an ideal e-mail system for the majority of nurses to use would include an environment with a high number of private computer terminals available for nurses to access their e-mail accounts with each of these terminals linked to a laser printer. Most importantly, it would have to be a user-friendly e-mail system. This would demand an icon-based interface with implicit commands graphically

displayed on the computer screen. System-specific, hands-on e-mail instruction would be a required part of orientation to any nursing position in a new facility and would be conducted one-on-one by a knowledgeable nursing colleague. E-mail users would be able to send any file as an attachment and be able to read attachments sent to them from within or outside the institution. The e-mail systems would have a bulletin board with appropriate category headings to assist users in triaging their messages. There would be built in security features that individuals did not have to think about and an easy process for changing passwords. Network passwords would also be required for all individuals with desk-top computer access. There would be 24 hour responsive technical support available. In addition, individuals would be aware of a personal and financial commitment from the administration, promising to maintain the system in good working condition and provide needed hardware and software upgrades.

These findings also add credibility to the suggestion that nurses should be an integral part of the selection and planning process involved in establishing an electronic communication system in a healthcare environment that employs nurses. Nurses can identify how to create a supportive environment that enhances rather than disrupts daily work routines for other nurses who will be required to adopt the innovation. Nurses would have first hand knowledge of the particular technical and security features of the system important to potential nurse adopters. Developing strategies to increase individuals' adoption of a system is a valuable effort since the best systems are of no benefit to an organization if not used.

This study identified many factors previously cited in the research that impact nurses' use of e-mail. A small group of variables from previous studies were not supported; several new barriers and facilitators surfaced. To resolve these differences and attempt to conclusively define the field of factors that affect use of e-mail, a subsequent series of focus groups could be carried

out with nurse groups and non-nurse groups. Findings from focus groups using larger numbers of nurse participants could be compared to present findings to determine if specific nurse groups were accurately represented. Future researchers may also include a larger number of nurses who are not military or include military nurses as a separate population for result comparison. These study findings could then be compared with non-nurse groups to ascertain if any results are specific to nurses. Further research could identify if nurses are unique in pointing to lack of writing skills as an impediment to use of e-mail or the importance of formal system-specific education in promoting use of e-mail.

Further research could attempt to explain the incongruity observed by this study's participants between recent education and an individual's use of e-mail. A study that examined not only the timing of educational preparation but the amount of individual computer skills required to complete course work and the amount of computer support and access provided by separate institutions would be appropriate.

The fact several nursing faculty in the present study viewed e-mail as very easy to adopt while staff nurses and students identified significant barriers may suggest issues yet unidentified. For example it may be that transferable skills held primarily by faculty may be important in easing use of e-mail. Or possibly, computer terminals are more readily available to faculty than students or nurses working in a hospital. Faculty systems may just be easier to use. Another option to consider is the possibility that some cognitive strategies may be at play which lead to improved ease of adoption for this faculty group. In addition, faculty response to social acceptability may have demonstrated more consensus than existed in other nursing groups. Future research with a larger sample of nurses from this population is necessary before any of these inferences can be supported due to the small sample size of faculty included in this study.

Specific characteristics of e-mail content affecting appropriateness were not probed in this study. Yet it is clear that some subjects rate the sensitivity of information they share and have a loosely identified threshold of tolerance for material which is appropriate for e-mail. Nurses consider some materials inappropriate for e-mail and further research could identify the characteristics perceived to affect content appropriateness. These characteristics may be prominently considered by other e-mail users but only minimally addressed by subjects in this study. As more and more information within and between hospitals is transmitted via e-mail, concerns for confidentiality of information and password integrity will be heightened. Strategies to combat this fear must be adopted so this will not be a barrier preventing nurses from using this communication system.

Since e-mail is relatively new, nurses who are recipients of e-mail messages may be poorly prepared to triage mail, to delay opening mail, and to incorporate e-mail use into a work day. Reinhardt (1993) described e-mail as being as pervasive as the telephone. Over time, technology has devised mechanisms to control the intrinsic intrusiveness of the telephone. Similar practices will be devised for e-mail. Focus group research can assist in identifying options and strategies that will be effective.

A future investigator may choose to conduct qualitative research utilizing focus groups exclusively with e-mail users in one group and e-mail non-users in separate groups. E-mail non-users may be less inhibited about sharing their comments in front of their peers if they know that every member of the group does not use e-mail. Designing a study with this sample criterion would also increase representation of e-mail non-users.

Qualitative methods have the capacity to guide nursing practice and to contribute to instrument and theory development (Marcus & Liehr, 1998). Future research efforts could use

the findings of this study as a first step in instrument development. The purpose would be to construct an instrument that could readily identify barriers and facilitators impacting e-mail use. A more concrete method of surveying nurses about perceived barriers and facilitators to use of e-mail could be useful in an organizational setting attempting to identify why nurses are not utilizing e-mail.

In 1990, Romano stated :

As organizations struggle for survival with pressures to compete in turbulent times, with external demands for cost containment, with the coexistence of professional goals and administrative business strategies, and with the reality that technical change and innovation are ever present, the diffusion of technology innovations will be of increasing concern in health care environments. This area of study merits the explicit attention of researchers, especially nurse researchers who have neglected this topic in the past: future effectiveness of the health care delivery system demands it (p. 20).

This sentiment is echoed still today. This study has contributed to answering this question: what do nurses identify as barriers and facilitators to the use of e-mail? Additional research needs to be directed toward identifying and verifying the relationship that exists between each of the factors found to impact use and the decision making process individual nurses use when attempting to adopt this technological innovation.

Appendix A
Student Focus Group Invitation Letter

OPPORTUNITY TO PARTICIPATE IN NEW RESEARCH!!

Dear Colleague.

You have been chosen from nurses studying in your institution to participate in a discussion about factors impacting nurses' use of electronic mail (e-mail). Your decision to participate is voluntary.

I am a nurse in the U.S. Air Force and presently enrolled in a graduate nursing program at the University of Texas Health Science Center at San Antonio. I am conducting a research project as a Master's thesis, with the goal of identifying factors which affect nurses' utilization of e-mail in the workplace. The purpose of this discussion group is to develop a list of perceived barriers and facilitators to be included as items on a survey instrument to be developed and tested at a later date.

The long term benefits of your participation will be realized in future development of user-friendly e-mail systems and increased communication among nursing colleagues.

The discussion will be among you and other invited nurses. The interaction will be audiorecorded and transcribed, but individual participants will not be identified by name. You will not be asked to reveal your name and all data reports will be anonymous. I plan to publish the results of this study, but there will be no identification by name of those participating in the group discussions.

Your attendance at this focus group will indicate your willingness to participate in this study and your consent to be audiorecorded. You may decide to leave the discussion group at any time.

If you are willing to participate, please join me on Wednesday, September 17, at 2:00 PM in Room SL 246; the electronic classroom in the basement of the new nursing building at UTHSCSA. I anticipate the discussion to last 60 to 90 minutes and refreshments will be provided.

Thank you for considering this invitation. Your attendance will be extremely helpful and greatly appreciated. If you have any questions about this focus group please do not hesitate to contact me at (210) 675-2587.

Sincerely,

Judith Hughes, Capt, USAF, NC

Appendix B
Faculty Focus Group Invitation Letter

OPPORTUNITY TO PARTICIPATE IN NEW RESEARCH!!

Dear Colleague,

Thank you for agreeing to participate in a discussion about factors impacting nurses' use of electronic mail (e-mail). Your decision to participate is voluntary.

I am a nurse in the U.S. Air Force and presently enrolled in the graduate nursing program at the University of Texas Health Science Center at San Antonio (UTHSCSA). I am conducting a research project as a Master's thesis, with the goal of identifying factors which affect nurses' utilization of e-mail in the workplace. The purpose of this discussion group is to develop a list of perceived barriers and facilitators to be included as items on a survey instrument to be developed and tested at a later date. The long term benefits of your participation will be realized in future development of user-friendly e-mail systems and increased communication among nursing colleagues.

The discussion will be among you and other invited nurses. The interaction will be audiorecorded and transcribed, but individual participants will not be identified by name. All data reports will be anonymous. I plan to publish the results of this study, but there will be no identification by name of those participating in the group discussions.

Your attendance at this focus group will indicate your willingness to participate in this study and your consent to be audiorecorded. I anticipate the discussion to last 60 to 90 minutes and refreshments will be provided. You may decide to leave the discussion group at any time.

I look forward to meeting with you on Monday, November 24, at 10:00 in Room SL 246; the electronic classroom in the basement of the new nursing building at UTHSCSA. If you have any questions about this focus group please do not hesitate to contact me at (210) 675-2587.

Sincerely,

Judith Hughes, Capt, USAF, NC

Appendix C
Hospital Focus Group Invitation Letter

OPPORTUNITY TO PARTICIPATE IN NEW RESEARCH!!

Dear Colleague.

You have been chosen from nurses working in your institution to participate in a discussion about factors impacting nurses' use of electronic mail (e-mail). Your decision to participate is voluntary.

I am a nurse in the U.S. Air Force and presently enrolled in a graduate nursing program at the University of Texas Health Science Center at San Antonio. I am conducting a research project as a Master's thesis, with the goal of identifying factors which affect nurses' utilization of e-mail in the workplace. The purpose of this discussion group is to develop a list of perceived barriers and facilitators to be included as items on a survey instrument to be developed and tested at a later date. The long term benefits of your participation will be realized in future development of user-friendly e-mail systems and increased communication among nursing colleagues.

The discussion will be among you and other invited nurses. The interaction will be audiorecorded and transcribed, but individual participants will not be identified by name. You will not be asked to reveal your name and all data reports will be anonymous. I plan to publish the results of this study, but there will be no identification by name of those participating in the group discussions.

Your attendance at this focus group will indicate your willingness to participate in this study and your consent to be audiorecorded. You may decide to leave the discussion group at any time.

If you are willing to participate, please join me on Wednesday, January 14, 1998, at 4:00 PM in the Clinical Investigations conference room. Clinical Investigations is building # 4430 and is located behind the hospital next to the dental clinic. It is adjacent to the parking lot for the hospital's auditorium entrance. I anticipate the discussion to last approximately 90 minutes and **food and drinks will be provided.**

Thank you for considering this invitation. Your attendance will be extremely helpful and greatly appreciated. If you have any questions about this focus group please do not hesitate to contact me at (210) 675-2587.

Sincerely,

Judith Hughes, Capt, USAF, NC

Appendix D

Moderator Guide

Moderator Guide

1. What kinds of things do you use e-mail for ...as a student??....as a nurse??
2. What are some of the benefits you have found in using e-mail?
3. What are some of the disadvantages you have found in using e-mail?
4. What kinds of things make it easier for you to use e-mail?
3. What kinds of things make it difficult for you to use e-mail?
4. Are there things you would change about the e-mail system itself that might increase your use of e-mail??
 - Are there things about passwords you like or dislike?
 - Are there things about printing you like or dislike?
 - What about the volume and content of mail messages?
5. Is privacy an issue....tell me about that
6. Have you had any training or education about an e-mail system?tell me about that..
-Does it affect your use of e-mail....?
7. Have you ever needed help using an e-mail system?
 - What different kinds of support are you aware of?
 - Have you ever used support services?
 - How was the support??
8. What has your experience been with having access to e-mail ?
 - do you have time
 - do you have desk-top computer access
 - do you feel like you are expected to use the system
9. Do you generally feel comfortable using computers??...Does this affect your use of e-mail?
-tell me about this??

Appendix E

Questionnaire

Please provide the following general information to assist me in describing my study population. Only group statistics will be reported. Circle the correct response or fill in the requested information.

Thank you.

1. Your age:

- a. 20-25
- e. 41-45
- i. 61-65
- b. 26-30
- f. 46-50
- j. 66-70
- c. 31-35
- g. 51-55
- k. Over 70
- d. 36-40
- h. 56-60

2. Your gender:

- a) Female
- b) Male

3. Your highest level of education:

- a) Bachelor Degree
- b) Bachelors Degree with some graduate work
- c) Masters Degree
- d) Masters Degree with some Doctoral work
- e) Doctoral Degree

4. Year of last nursing degree _____

5. Year of initial registered nursing license _____

6. Years of experience as a registered nurse:

- a) Less than 5 years
- b) Between 5-10 years
- c) Between 11-15 years
- d) Between 16-20 years
- e) Between 21-25 years
- f) Over 30 years

7. Identify your present primary job function as one of the following:

- a) clinical
- b) administrative
- c) student
- d) teaching
- e) research

8. Do you have a computer at home?

- a) YES
- b) NO

9. How often do you use electronic mail (e-mail) ?

- a) Never access my e-mail account
- b) Access my account only if someone else does it for me
- c) Use e-mail infrequently (Less than half of the days I go to work or school)
- d) Use e-mail independently almost every day I work or go to school

10. Are you expected to use e-mail more than you do?

- a) YES
- b) NO

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VITA

Judith Anne Hughes is the daughter of Roger and Denise Henri. She was born in Leominster, Massachusetts on the 27th of March 1965, and graduated from Saint Bernard's Central Catholic High School in Fitchburg, Massachusetts in June of 1983. She received a Bachelor of Science degree graduating cum laude from Saint Anselm College, Manchester, New Hampshire, in 1987. Judi received a commission in the United States Air Force in May 1987.

Since entering the military, Captain Hughes has had several assignments gaining experience as a staff nurse in medical-surgical wards, special care units, the emergency room and a hematology-oncology ward. For two years before starting graduate school she worked as the night/weekend nursing supervisor in the Air Force's largest medical center. She was admitted to the University of Texas Graduate Department of Biomedical Sciences at San Antonio in August 1996. Graduate education was funded by the United States Air Force. Captain Hughes is a member of Sigma Theta Tau, the International Honor Society of Nursing and the American Society of Pain Management Nurses.

Judi married Mr. Brian Hughes on September 22, 1991 and they have two beautiful children. Connor Henri was born August 22, 1995. Audrey Victoria was born December 12, 1996, the last day of class in her mom's first semester of graduate school!